THE GLASS INDUSTRY

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# *The World is Waiting for Glass*

Business is good in the glass industry. With the exception of plate glass, where restrictions on automobile production are having an adverse effect, plants are running at full blast.

This activity will continue for some time to come, and if anything, it will become intensified. In handmade glass, the shutting off of imports leaves the American manufacturer with a virtual monopoly. With containers, the defense emergency is causing some of the country's largest packers to substitute glass for tin and paper. Optical glass is required in quantities greater than ever before. All glassware is benefitting from the business upswing and the building up of inventories. It is a sellers' market.

In a sellers' market, the manufacturer does not have to dig for business; business comes to him. His major problems are to find sufficient raw materials, equipment and labor, and then to allocate his output in such a way that none of his customers will become disgruntled. With more business than he can handle, he becomes choosy: it is plain horse sense to give the right of way to a type of order that will keep his machines operating without changeovers; to weed out business having the smallest profit potentialities; to give preference to class A customers. And so on. All this is just good business.

Or is it?

If war conditions were destined to continue indefinitely, and if the sellers' market were here to stay, then most assuredly it would seem to be good business. But many are looking beyond the war period and they do not like what they see. Almost any conversation among business men will include sooner or later some reference to a post-war depression.

What is going to happen then? The glass manufacturer, like every other manufacturer, will have to scratch and scratch hard for his business.

That scratching should begin now.

Consider the opportunity. The entire competition—metals, plastics and paper—is hamstrung with defense priorities. Buyers using these materials are searching frantically for available substitutes. Today, many industries would gladly turn to glass if they knew glass could do the job. Contrast this attitude with only yesterday, when glassmen had to appropriate thousands of dollars annually to get a hearing for their story.

The opportunity which the glassman has today to place new customer names on his order books is without a parallel. And not only new customers, but new users of glass and new uses for glass. Once on the books, it should be possible for any glass company to keep at least a portion of its new business permanently.

Experimentation will be necessary, of course. Normally, the management of a factory that is already sold up to the hilt would not think of experimentation. Development work, short runs and fussy orders interfere with regular production and raise costs. Which brings us to the crux of the situation—profits.

A little reflection will show the glassman that the accepted theories under which he has operated successfully in the past are not the proper operating methods under the present tax set-up. A policy of squeezing every last ounce of production out of the equipment earns very few dollars for the management today and ignores the fundamental necessity of providing reserves against a rainy day tomorrow. Unless a management policy provides reserves of some kind, no business can exist for very long.

Look at the tax situation as it affects current earnings. Other things being equal, the nearer a factory approaches 100 per cent of operating capacity, the more money it will earn. The percentages exceeding, let us say 90 for the sake of a figure, are those that produce the higher digits of the profit column. But these same higher profit numerals are the ones taxed the most heavily. Which is to say: the nearer a plant approaches operating capacity, the less profitable *to the management* do its activities become.

Look at the situation from the standpoint of reserves. It used to be good business policy to ride an upturn for all it was worth, earn a good surplus, and salt away part of this surplus against bad times to come. But today it is against Government policy to accumulate reserves, and the tax program has been devised for the specific purpose of making it well nigh impossible.

How, then, can a glass company cushion itself against any protracted post-war depression? The most logical method and, in fact, the only sure protection is to broaden its markets, to secure greater sales outlets, to get its products established in as many industries and for as many purposes as it can. Market research will uncover many places where glass can do a better job.

The time to do that is now. When earnings make such a program possible. When almost every industry of the country is open minded. The world is waiting for glass. Glassmen should open this door before the opportunity to do so passes.

*John T. Ogden*

# GLASS COMPOSITION CONTROL BY THE USE OF SPECIFIC GRAVITY DETERMINATIONS

In the continuous tank method of producing glass the chemical composition of the glass being produced may be controlled either by routine chemical analysis or by the routine measurement of some physical property of the glass which is known to vary with variations in the chemical composition. Specific gravity, refractive index and softening point are three of the more common physical properties that are influenced by the chemical composition and their measurement can be used as a means of routine control. Of these three physical properties, that which concerns specific gravity is the more useful for the small plant laboratory; since special equipment is not required and the determination may be made so accurate that very small changes in compositions may be detected.

Specific gravity measurements often are miscalled density measurements. Density, however, is the relation between mass and volume, while specific gravity is the relation between the weight of any substance to the weight of an equal volume of water measured at a standard temperature. There are several different methods that can be used for determining the specific gravity of solids; namely, the pyconometer method, the flotation method, and the method of Archimedes. While all three methods have been used successfully for routine control the method of Archimedes is more suited to the average laboratory, and when certain precautions are taken the method is quite accurate.

When this method is used in a routine manner, the selection of the samples is of first importance. It is well known that glasses identical in chemical composition may vary considerably in specific gravity depending upon the heat treatment they have received, whether in the tank or through annealing. For this reason samples used in routine work should have the same, or nearly the same, thermal history. Whether bottles or flat glass, the daily sample should be taken from the same shop and the same lehr each day, and the size and shape of the sample, the lehr temperature and the grade of annealing each should be identical from day to day, as far as this is possible. In the method which is to be described it is assumed that these conditions have been met.

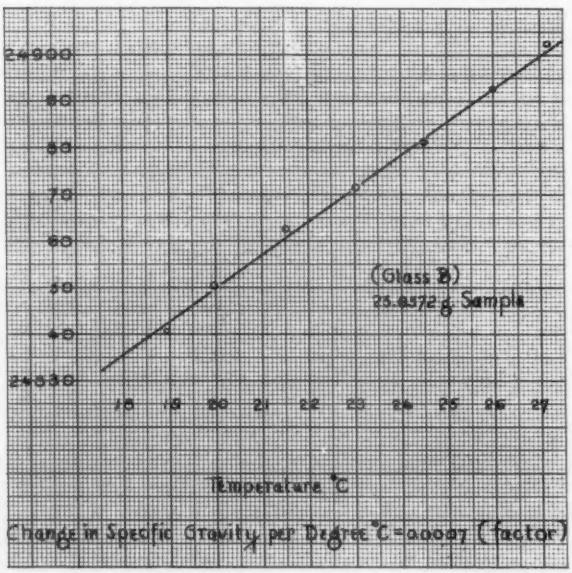



**Fig. 1. Straight line relationship showing the change in weight with temperature.**

### Apparatus Required

1. A chemical balance having a sensitivity of 1/10 mg. The balance should be so adjusted that the pointer will come to rest on the zero point of the scale.
2. A set of balance weights. These must have the same accuracy as those used for chemical analysis.
3. A 250 ml. pyrex beaker.
4. Two 500 ml. pyrex Florence flasks.
5. 3 feet of platinum-rhodium wire (0.4 mm. dia.) to be used in forming a wire basket.
6. 1 foot of platinum wire (0.001 to 0.0026 in. dia.) to be used for suspending the wire basket.
7. Beaker platform, this usually is part of the balance equipment.
8. Two thermometers, 0-50° C. having 0.1 degree divisions.

### Procedure for Determining the Specific Gravity of the Glass Sample

1. The glass sample is wrapped in a clean cloth and broken with a hammer or pestle. Pieces weighing between 5 to 7 grams are selected so that the total weight of the sample will be between 20 and 25 grams. Glass pieces which are seedy, stony or which contain cracks should not be used. Those having sharp edges should also be rejected; they not only may cut the platinum basket but should the edges become chipped off while the pieces are being weighed, discrepancies between the actual weight and recorded weight would result. All handling of the glass pieces should be conducted with tweezers as the glass may pick up oil from the hands. Such oil is difficult to remove and will materially affect the weight. The glass is then washed in alcohol and placed in a crucible. After drying in an oven the crucible and glass pieces are then placed in a dessicator and allowed to cool to room temperature.

2. While the sample is being selected the water can be in the process of preparation. Partially fill the two Florence flasks with distilled water and boil so that all dissolved gases are removed. After a vigorous boil, remove the flasks from the heat and stopper them. Cool one of the flasks by placing it under the cold water tap so that a small cool stream will flow over the outside of the flask. Allow this boiled water to cool until below room temperature.

3. The glass sample in the crucible is now removed from the dessicator and the glass pieces placed on the balance pan by means of the tweezers. The sample is then carefully weighed to tenths of a milligram and the weight recorded as the "Weight in Air."

4. The cooled boiled distilled water is then placed in the 250 ml. beaker in an amount sufficient to cover the

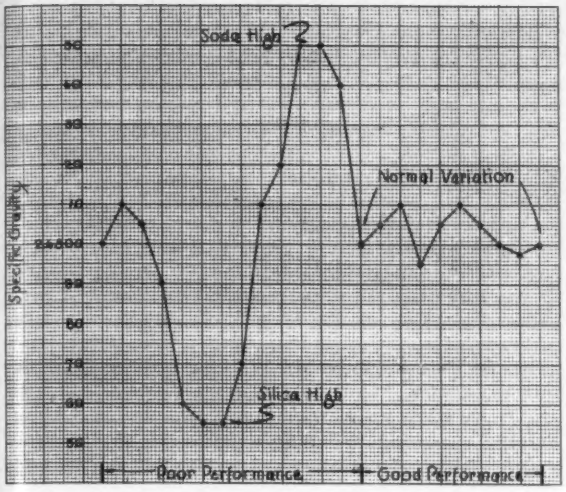



**Fig. 2. The plotting of daily specific gravity determinations shows up the various types of glass composition changes.**

wire basket when it is suspended in the balance. The temperature in the room is noted and the water in the beaker is adjusted to nearly room temperature by adding, if necessary, some of the warmer water from the second flask. Thorough stirring is necessary when the addition is being made.

5. The glass sample is then removed from the balance pan, again by tweezers, and placed in the platinum wire basket and suspended in the balance by the use of the fine platinum wire. The prepared distilled water is then placed on the platform over the balance pan and the basket lowered into the water. The platform must be placed so that it does not interfere with the free motion of the balance pan. The basket and sample must also be carefully examined after it is immersed in the water in order to make sure that there are no air bubbles either on the wire, basket or sample. If bubbles are present they can usually be removed by agitating the basket and sample in the water. If the bubbles are not removed by this procedure the basket sample may be greasy and must be cleaned by washing in alcohol. The basket should also be cleaned at intervals by igniting it in a flame. If no bubbles are present, the sample and basket are then weighed to tenths of a milligram while suspended in the water. The final adjustment of weights being made with the balance door closed. Record this weight as the "Weight of Glass and Wire Basket in Water."

The action of the water surrounding the glass and basket will slow down the motion of the pointer, however; with a little practice, the operator will soon learn when the correct weight has been obtained. (Note: the use of the fine platinum wire for suspending the basket in the water allows the water surface to be broken at one point only with the result that capillary action will be at a minimum. The level of the water above the basket should be kept constant from determination to determination so that the same amount of wire will be submerged at all time.)

6. The temperature of the water is taken as soon as the weighing is completed and recorded as the "Temperature of the Water."

7. Repeat the procedure as in 5 but with the basket empty. It is not necessary in this case to again adjust the temperature of the water. Record the weight as the "Weight of the Basket and Wire in Water."

With the data thus obtained the specific gravity of the sample may be determined by a simple calculation in which the weight of the glass sample in air is divided by its loss of weight in water. Such a calculation will give the specific gravity of the glass at the temperature at which the determination was run. As the specific gravity of the sample will vary with the temperature, specific gravity determinations made at different temperatures are useless for control work. To be useful as a measure of composition changes, the results must be referred to a standard temperature.

There are several different methods of correcting the results to a standard temperature basis. In one, the measurements of weight and temperature are made as usual and a series of correction factors combining the effects of temperature on both glass and water are used and the measurements thus corrected to water at 4° C. As the coefficient of expansion of glass varies with its chemical composition, the correction factor obtained if a constant chemical composition is assumed, will cause the results to be somewhat in error when composition changes do occur.

In another method it is assumed that if the specific gravity measurements were all made at a constant temperature, for example, 22° C., there would be no need for correction factors and the results obtained would be an accurate measure of the specific gravity of the glass samples. In the usual laboratory it is quite difficult to maintain a standard temperature such as 22° C., especially during the summer weather. The measurements are therefore made as close as possible to the standard temperature.

The method of obtaining this correction factor is as follows: two flasks of distilled water are prepared as previously described and a glass sample similar in composition to the glass being controlled is weighed in air with the usual accuracy. Two beakers are then nearly filled with the freshly prepared water and their temperatures adjusted so as to be the same and several degrees lower than the room temperature. One beaker is placed on the specific gravity platform while the other which contains the thermometer is placed on the floor of the balance.

The platinum basket is then suspended in the water and weighed. The temperature of the water is recorded. The glass sample is then placed in the basket and the weight of the glass and basket and the temperature of the water recorded. As the temperature of the water increases, additional weighings are made and the temperature corresponding to each weighing is noted. At least 7 weighings should be made over a temperature range of 5 to 7° C. The temperature of the water in the beaker on the balance floor is taken as being the same as that in which the sample is being weighed. At the end of the run the temperatures of the water in the two beakers should be the same.

The data obtained is then plotted on graph paper and a curve is drawn showing the change in weight with temperature. From this curve the weight at various temperatures is taken and specific gravity calculations

TABLE I

SPECIFIC GRAVITY DATA

| | | |
|---|---|---|
| Test No. | | Date |
| Factory | Tank | Shop |
| Lehr | Annealing | Cord Grade |

1. Weight of glass in air
5. Weight of glass in water
6. Loss of weight in water
2. Temperature of water
3. Weight of glass and basket in water
4. Weight of basket in water
5. Weight of glass in water
7. Correction factor
8. Divide 1 x 6
9. Calculate difference between 2 and standard temperature
10. Multiply 9X factor
11. Add or subtract 10 to or from 8
12. Specific Gravity at standard temperature (11)

for these various temperatures are made. As this is a straight line relationship, the change in specific gravity for each degree change in temperature may be determined by simple calculation. This relationship is shown graphically in Fig. I.

The value so obtained is then used as the factor when correcting the results to the standard temperature. The correction is made in the following manner: after determining the specific gravity at room temperature, the difference between the observed temperature of measurement and the standard temperature is multiplied by the factor and the result added or subtracted from the found specific gravity, depending upon whether the measurements were made at a lower or higher temperature.

A form similar to that shown in Table I will prove very useful for recording the essential data. A determination of the specific gravity of a standard sample should be made at least twice a week as a check upon the accuracy of weighings and other manipulations. A variation of ± .0002 may be considered a good check.

In order to get the most use from daily routine specific gravity determinations, the results obtained should be plotted on monthly-type graph paper, leaving sufficient space for the recording of other essential data such as chemical analysis, batch changes, batch-cullet ratios, cord-gradings and the like. With such a system the complete story of the "how and why" of the condition of the glass may be seen in a glance. Figure 2 illustrates how the plotting of daily specific gravity determinations shows up various types of glass composition variations. In general, a change of .001 in specific gravity indicates a change of 0.1 per cent in one constituent. The specific gravity of a glass is lowered by an increase in silica or alumina and raised by an increase in calcia, magnesia or soda.

While routine specific gravity determinations made on a daily basis cannot replace routine chemical analysis methods, it does, when coupled with chemical analysis, allow a much better control to be made as it indicates the need for the necessity of extra chemical analysis. In addition, the specific gravity determination can be made in a few minutes, while the chemical analysis requires at least two days.

• Mr. Samuel S. Isseks, of the Department of Justice, has been placed in charge of the anti-trust work in the New York District.

## GLASS DIVISION FALL PROGRAM

The 13th fall meeting of the Glass Division of the American Ceramic Society will be held at the Hotel Conneaut, Conneaut Lake Park, Pa., September 12 and 13.

Registration of the members will start Friday morning, the twelfth, and in the afternoon the following reports and discussions will be held:

1. Report of Committee on Nomenclature and discussion of "Definition of Glass," in charge of Francis C. Flint.

2. Report of the A.S.T.M. Committee on "Standards," in charge of Louis Navias.

3. Report of Committee on Light Protective Glasses for Pharmaceutical Work, in charge of Francis C. Flint.

In the evening a talk on "Sterilamps" will be given by Alfred Paulus of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

On Saturday morning, the following papers will be presented:

1. "Water Hammer Breakage in Glass Containers," T. C. Baker.

2. "Selenium Ruby Glass," John D. Sullivan and Chester A. Austin.

3. "The Chemical Mechanism of Decolorizing Glass with Selenium," Frank Day, Jr., and Alexander Silverman.

4. "Alumina-Silica Relationship in Glass," Hurd W. Safford and Alexander Silverman.

Saturday afternoon will see the golf tournament on the Conneaut Lake Park links under the charge of S. R. Scholes. A prize for the golf tournament is being donated by Ernest Hommel. The Glass Division Dinner will be held Saturday evening and this will be followed by a card party. This also is in charge of S. R. Scholes. The prizes for the card party are being donated by the Corning Glass Works.

**The Oscar Hommel trophies which the O. Hommel Company, Pittsburgh, Pa., will award to the "outstanding" golfers at the Whiteware and Glass Division meetings.**

• The Fall Meeting of the Glass Container Association will be held at the Seigniory Club, Montebello, Canada, September 22nd through the 24th.

**WANTED**

A copy of the April 1934 issue of THE GLASS INDUSTRY. Please communicate with Dr. Alexander Silverman, Dept. of Chemistry, University of Pittsburgh, Pittsburgh, Pa.

# THE GLASSMAKING SITUATION

**How is the industry faring with respect to its supplies of batch making materials. What are the most dangerous elements in the fuel picture? To what extent is the shortage of metal affecting the entire glass making picture? At a time when defense requirements are pre-empting packaging materials of all kinds it is important to survey the glass makng situation and ascertain how well glass will be able to carry the load.**

It is a curious fact that although American participation in World War II has not assumed the proportions, so far, of World War I, restrictions have occurred at a much earlier period. Some of these restrictions have been due to the "all out" intensity of the present conflict; but it is probable that the effort to prevent civilian shortages is responsible for most of it. Much of what appears to be actual shortage is not a shortage in the true sense. It results from a policy of conservation, the idea being that if we use even substantial reserves sparingly today there will be no lack tomorrow.

Just how wise the system is proving, and whether the cure may prove more painful than the disease, is foreign to the present discussion which concerns itself with the condition of raw materials and equipment available to glass makers. Glassmen want to have this information because it concerns their business vitally. But leaving the glassmen out of it, the matter still is important. Practically all the materials from which the great bulk of glass is produced come from the earth. There is a great abundance of these materials: no sea lanes need be kept open to import them; with a few possible exceptions, none of the essentials is used by war industries. The finished product can be used to replace metals, paper and tin which are so badly needed for other purposes. It is, therefore, much to the public interest to see that no shortages occur in glass making; for if the war is of long duration, the industry will be called upon more and more to substitute for these other materials.

The information reported in the following paragraphs has been secured by questionnaire from the glass companies themselves, from equipment manufacturers and from suppliers of chemicals and other batch ingredients. It should be mentioned that all have cooperated most willingly in furnishing data.

### Fuel

The majority replying to our questionnaire were oil users. Only two expressed any doubt whatever but that their oil supply would be ample and unfailing. One of these two is a user of Bunker C grade. A number of glassmen who are not now using oil, state that they have under immediate consideration a change to that type of fuel, in one case at a 50 per cent increase in cost. Paradoxically another glass company is changing from oil to (producer) gas.

These fuel change-overs are not due to any diminution of the supply, but to increased local defense activity. The defense authorities have been utterly callous in their lack of consideration of the non-defense industries. In one Pennsylvania locality sub-marginal steel units, long in disuse, have been reopened. Whereas coal would be the logical fuel for these plants, gas is simpler to handle. Expense being no object, the old steel mills have taken over the supply of natural gas that formerly went to the glass factory. The latter company estimates its new fuel (oil) will increase costs 50 per cent.

This survey indicates that almost every kind of gas is used by glassmen—natural, city, producer, propane, butane. While the majority of natural gas users hold no fears as to their supply, some have a great deal to worry over. Particularly in the West Virginia area, defense industries have tapped certain of the regional trunks to such an extent that they already are worked to near capacity. With colder weather, a heavy drain will be made by home and industrial heating. Gas companies have notified certain glass companies in that area to expect a 50 per cent reduction in supply about mid-October, with a total shutoff at from 3 to 6 hours' notice with the arrival of zero temperatures. Gas will be rationed, first for home heating, next to defense industries, and if any is left it will go to non-defense industries. A report (unconfirmed) states that Southern California factories are apt to experience the same trouble with natural gas as the West Virginians.

The industry already has a number of propane standby systems. Several are considering installing them. No one apparently fears any shortages of propane. One large Eastern manufacturer of liquified petroleum gas has anounced that it will not take on any new customers, and states that shortages of crude oil in the East raises some question as to how much may be refined in that territory. Propane uses, and pospective users, would therefore seem to be well advised if they checked into the situation in their locality to see if it affects them.

None of the regions in which glass is produced has ever been mentioned in connection with a dearth of electricity. However, in view of all the talk in Government circles, the question was asked. No glassmen had anything unfavorable to report. So with coal—strikes and freight cars permitting. However, as most contracts for electricity contain a full clause, there is bound to be an increase in the cost of electrical power in many areas.

### Batch Materials and Chemicals:

With respect to the materials used in large quantities, the general statement can be made that there are no real shortages. Transportation is causing trouble of a kind, but that seems to be the worst difficulty. In this connection, glassmen report that their cars are arriving in blocks, perhaps half a dozen cars of sand at a time, instead of individually in a steady, day-by-day flow. They do not have adequate storage facilities to handle batch materias in this manner, and unloading crews either are idle or overworked. Demurrage is only one item of the extra cost entailed.

All *Soda Ash* plants are running to capacity and are from a few days to a week behind in deliveries. No improvement in the situation is foreseen. Although soda ash is used by industries generally, the need is for light soda ash and not so much for the dense type used by glassmen. Should priorities have to be invoked to conserve civilian requirements, they are not expected this year and it is not believed that they would affect the glass industry.

The *Borax* situation which has been so troublesome all summer is now clearing up nicely. However, produces are still fighting the tremendous back log of orders accumulated during the strike and thus has made it necessary to extend the priorities. Each passing day sees an improvement in the situation. It should be remembered that the enamel industry, one of the largest consumers of *Borax*, makes such products as bath tubs, basins, etc., required by cantonments and hence are classed as defense materials. Supplies of *Borax*, however, are entirely adequate for any demands that can be envisioned at present.

The *dehydrated* type of *Borax* is somewhat harder to obtain than the ordinary; but here, too, things are improving.

*Boric Acid* is still presenting difficulties and will continue in that fashion for a longer period. However, in the glass industry the largest consumption goes into borosilicate glasses, used for defense, and these have a high priority rating.

With *Potash*, the situation is still tight and will remain that way at least for the balance of the year. The industry might be said to be living under a rationing regime, with no one allowed to build up inventories. Due to these precautions, there is just enough to go around and no one will be hurt. A factor in the potash situation is the lend lease act, and while no figures are available, it is believed that export shipments are the upsetting factor.

*Feldspar, Aplite* and *Nepheline Syenite* are plentiful and are mentioned only for the record. With the latter product, the largest producer is installing new equipment that will increase capacity 50 per cent. The only possible cloud on the horizon with these products seems to be the freight car problem, which, however, is a worry by no means exclusive to these materials. Glassmen, however, are somewhat apprehensive that the pressure of war conditions may lead to a lowering of standards, particularly with reference to the iron content.

*Lime*, although produced in great quantities, is used widely. Defense activities consume a large tonnage of raw dolomite, burned dolomite, burned lime and hydrated lime, more particularly for steel and magnesium products, and in addition building construction and soil conservation is drawing heavily on lime. Shipments are heavier than at any time in 20 years. Subjects to fuel and transportation limitations, the demand will continue heavy but suppliers state they can take on more business.

*Cryolite*, used in making metallic aluminum and as an opacifier for opal ware, is reported as a serious shortage by all glass users. Manufacturers have declined to comment on the situation. *Sodium Fluoride* and *Sodium Silico Fluoride*, also used as opacifiers in opal ware, are also in this category. The supply of the latter depends upon hydrofluoric acid, of which there is a scarcity. *Hydrofluoric acid* is also used for frosting and for graduating laboratory ware. Both the Army and the Navy have bought up great stocks of *Sodium Silico Fluoride* for laundry purposes (bleaching). The shortage of these opacifiers appears to be one of the most serious situations in the glass industry, at least in the line of batch materials, and can conceivably put a stop to the making of opal ware. However, the resourcefulness of the industry's technologists may lead to the development of substitute methods; as, for example, the use of China clay or bone ash.

*Zinc Oxide* is another very troublesome item. All American producers of zinc oxide are required by O.P.M. to divert from their monthly production an amount equal to 10 per cent of their July output, and from this pool the Director of Priorities can make allocations for emergency needs. The basic reason for a shortage of zinc oxide, however, is not in facilities to produce this chemical but rather in the diversion of ore and metals which are used for so many other war purposes. With no importations, with only 90 per cent of the domestic supply available for non-defense purposes, the reason for the shortage becomes obvious. *Lead Oxide* and *Lead Silicate*, used in large quantities for electric tubing and also for hand made ware, seem to be adequately supplied.

A number of glassmen report difficulty in obtaining *Nitre*, which they use largely as a fluxing agent. *Arsenic* has been tight recently but producers say that the situation will ease. Some report that they have had trouble obtaining *Cobalt*, but this is not everywhere the case; there has been a definite tightening of the supply of late, but the situation is expected to become progressively better. A few have complained about *Selenium* and *Copper Oxide*, but suppliers see no reason for any trouble here. *Salt Cake* has been tight, but new sources of supply by which salt cake will be made by a direct process, will relieve the situation.

The list of coloring chemicals is too extensive to warrant individual treatment, particularly in view of the fact that few of them are used in large quantities and none of these by many glassmen. The general statement can be made, however, that all ceramic colors are made from metallic salts and that most metallic salts are on the Critial List and hence subject to priorities. With few exceptions, there is sufficient supply on hand of all coloring materials to carry the glass industry along on a basis comparable to 1940 operations. Manufacturers of these materials see no need for alarm at least during 1941. Beyond this, they will not commit themselves. The defense picture is a constantly shifting panorama, and as the needs of defense control the situation, the supply of coloring materials becomes just as unpredictable—and no more.

Perhaps the three darkest spots in the color situation are *Chromium, Titanium* and certain forms of *Manganese*. The distribution of *Chromium* products is limited by an order of OPM dated July 7 "to average consumption during the 12-month period from July, 1940, to June 30, 1941." This means that with *Chromium* compounds, as with many other colorants, the supplier is restricted by the Government as to what he can market. Incidentally, the belief holds that the Chromium situation will grow worse before it improves.

Though it should not be classed among the chemical and batch materials, *Emery* is scarce. The machine tool industry is a heavy consumer. Similarly, there are shortages of silicon carbide and fused alumina, a situation that was not improved by the destruction by fire in late August of the Exolon plant at Blasdell, N. Y.

**Shipping Containers:**

Reports on the shipping container supply present such discrepancies as to suggest that some glass manufacturers are either remarkably lucky, extremely foresighted in

(*Continued on page 397*)

# DEMUTH PLANT FEATURES DIVERSITY

**Demuth Glass Works is one of the best known glass factories in the metropolitan area of New York, where it supplies much of the colored rod used by the jewelry trade, tubing and laboratory ware. The plant has been partly modernized by the installation of new tanks.**

Successful plant operation as we have known it for many years has meant mass production. Whether it was lamps or lingerie, shoes or swim suits production has been measured in terms of hundreds of thousands or millions of units. The glass manufacturing industry is not an exception to the rule. For example containers are produced in millions of gross, plate glass in millions of square feet and window glass in millions of boxes. However, in spite of all this megalomania for huge production which today is emphasized more than ever before because of the present emergency, there are certain factories which can and must operate at a slower tempo. In the glass industry, The Demuth Glass Works, Inc., located in Brooklyn, N. Y., is just such a plant.

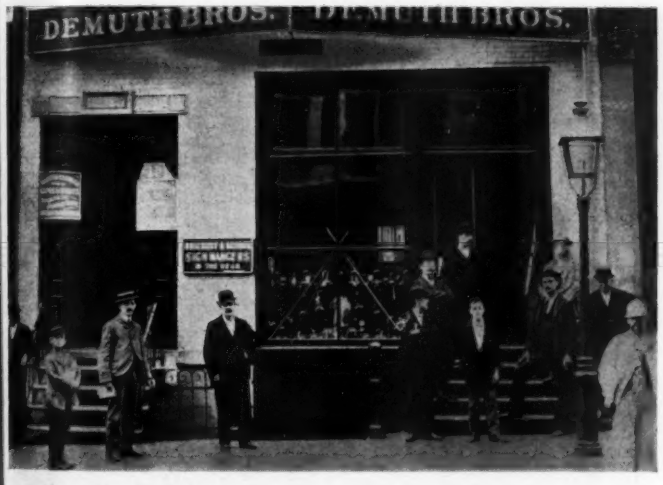
In sharp contrast to the plant which is geared to mass production with its engineered layout and highly mechanized facilities for producing a given type of ware is this factory which was conceived and is operated on an entirely different principle—namely the manufacture of a great diversity of ware in comparatively small quantities.

Variety is the essence of Demuth production. Its products range from glass rod to television tubes and in rod alone an idea of the enormous diversity of production can be gained when it is considered that at times more than thirty different colors are made in small amounts. The majority of the production is by hand and very little presswork is done. Private mold work is also undertaken.

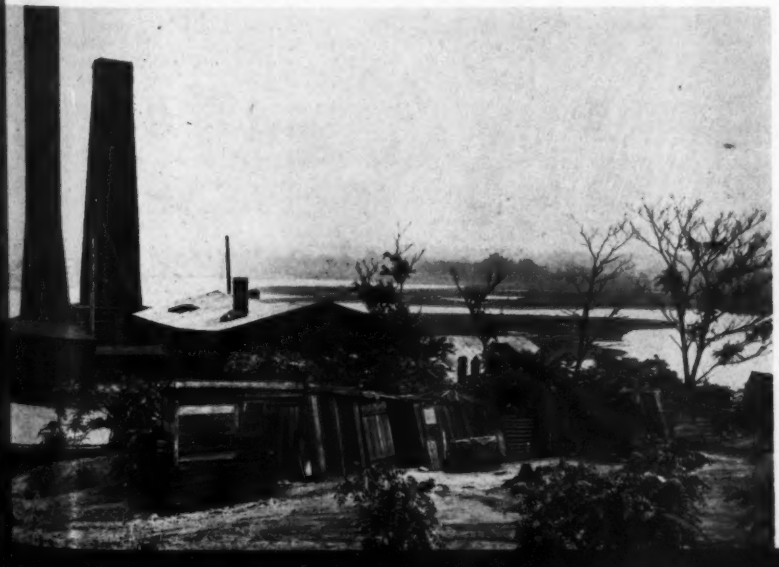
The glass rod made is drawn by hand, as is most of the different styles of tubing. The rod, in all sizes and colors, leaves the factory as a finished product, but it is the raw material of the trade which uses the bulk of it—the jewelry and novelty trade, which represses it into jewels, buttons, beads, reflector buttons, etc. A great many different colored glasses are made up in addition to the glasses regularly being melted. If a sample of glass is sent in to be matched for color, and the color is not already on hand in the stock room, a small batch is melted up in one of the pot units where there is an experimental pot for such puposes.

The hand drawn tubing is made primarily for the lamp trade, being made in twisted, fluted, hexagonal, round and square in straight lengths and shapes in crystal and color. Gauge glass tubing of lead and lime glass is also made. Cylinders for display, oil cups and vending machine parts are hand blown in molds. To save time and handling of the blown ware, it is taken directly to the lehr and "cracked off" in the lehr if no further work is to be done on it before lehring.

Laboratory ware has long been an item with Demuth




**The front of the Demuth Brothers factory at 89 Walker St., New York City, about 1880.**



**(Left) An exterior view of the factory on Newtown Creek as it looked in 1903.**

**The interior of the Newtown Creek factory. Mr. Adolf Demuth is standing by the square, 8 pot furnace.**

Mr. H. H. Haines, president of the Demuth Glass Works.

and is now being made in increasing quantities. This ware, being a defense item, has expanded the company's production in the past year. Several sub-contracts on defense orders for this type of ware are on hand and involving departments such as lamp working, calibrating and graduating. This glassware is made of lead and lime glasses. A Danner machine operates off the continuous tank on standard lamp working lime glass for ampoules, etc. On small tubing, a tank pull of between 4-6 tons of glass a day is not uncommon.

All batch mixing for the 30 odd glasses being melted, with the exception of the batch for the machine drawn tubing tank, is carried out in a home-made, power-driven, revolving iron drum. All materials are weighed out by hand in small containers. Babosil, a frit, is incorporated in the lime glass batches for the day tanks and the pot furnaces to take the place of some of the minor but important ingredients. The management feels that this combination batch material is advantageous because of their relatively small batches. The materials are screened to break up the lumps, and then put into the mixer. After mixing, the batch is dropped from the mixer into four-wheeled metal batch carts and hauled to the melting unit or units taking that particular batch. Because of the diversity of the glasses being regularly melted, the glass batches are small and the performance of the home-made mixer is suitable for the small batches and is equal to a "tailored" one in the eyes of the glass company officials. Batch handling, weighing, handling and feeding for the continuous tank is by automatic equipment next to the tank. Materials are fed into an enclosed hopper elevator to a storage bin, then weighed, mixed and elevated to a hopper over the dog house. Feeding of the batch is by means of a screw feed into the dog house.

The melting equipment consists of one 9 pot furnace, one continuous 25-ton recuperative tank, two 2-ton day tanks and two pot units. The ware is annealed in two Amsler lehrs. All firing for the melting units, lehrs and glory holes is by oil. Three different grades of oil being used: No. 4 for lehrs and glory holes, No. 5 for pot furnaces and day tanks, and No. 6 for the continuous recuperative tank. The oil is stored in underground tanks

The home-made batch mixer.

(Above) Putting the bead on a museum jar.

A three pot unit. One pot is for experimental melts.

of about 5,000 gallons capacity, and is trucked in as needed.

Four different types of burners are being used on the melting units, lehrs and glory holes; Hauck burners on the pot units and lehrs, Anthony burners on the pot furnace, North American burners on the two day tanks, and Baker burners on the continuous tank. The Baker burners used on the continuous tank are still in the experimental stage and at the present time are being operated on low pressure air using about 33 gallons of No. 6 oil an hour to maintain a temperature of 2650°F in the melting end.

A few months ago the company called in the Toledo Engineering Company to modernize its melting units and to erect two day tanks. The 9 pot furnace was completely repaired with a new bench, new eye and a new crown. The crown was lowered 7½ inches to gain more efficient and economical melting. Two new 2-ton day tanks were built end to end so that a common stack could be used. Laclede-Christy blocks were used for side walls and bottoms and Harbison-Walker silica brick for crown and arches. General repairs were made on the continuous recuperative tank making slight changes in the refining end and throat and adding a new crown.

The firm of Demuth Brothers originally consisted of four brothers, William, Max, Vincent and Adolf. William left the partnership to start his own business as a lamp worker, and later Max was killed in a railroad accident. In 1880, Vincent and Adolf Demuth started a small glass business at 89 Walker Street in New York City under the name of Demuth Bothers as glass blowers making glass butons, novelties and artificial glass eyes. Bird and animal eyes were made up for the American Museum of Natural History.

Around 1885, the two brothers started a one pot furnace at 12 Olive Street, Brooklyn, N. Y. The neighbors complained about the danger of fire, so the brothers took a lease from the Beadle Estate on ground located at the foot of Beadle Street and built an 8 pot furnace. The new factory faced Newtown Creek with dock facilities on

**The mandrel end of the Danner tube machine.**

**One of the experimental Baker burners used on the continuous tank.**

**The two new two-ton day tanks which were recently erected.**

**A typical shop in the factory. The man at the right drinking beer from a tin pail is reminiscent of the old glass making days.**

Kings County side. Lamp chimneys, glass tubing, rod and electric light bulbs were made. The electric light bulbs, in different sizes, were made "by the millions" for electric light companies before the Edison Electric Company claimed patents and controlled the entire output.

About 1925, the Brooklyn Union Gas Company bought over 100 acres along Newtown Creek and they allowed the Demuth Glass Company time to find a suitable site to relocate in, which was done in 1927 at the present site at North 11th and 12th Streets and Wythe Ave., Brooklyn. In 1934 the glass works, after many "ups and downs" was sold by the Demuth heirs to the present owners and the manufacture of glass was continued.

**The calibrating and graduating department for laboratory ware.**

The management of the factory feels that operating a glass factory in the New York area offers no disadvantages from the standpoint of supplies, raw materials, fuel or labor. The problem of expansion is, however, always present. The majority of customers for the jewelry and novelty trade are in a small radius of New York. The outlets for the lamp tubing and bases, as well as the laboratory ware and machine tubing, are with several exceptions, in the local area. This factory is one of the few to operate a retail counter in the factory and persons desirous to purchase a few length of rod or tubing, come in and get their needs. If and when the management feels the need to expand, their space is now limited and expansion is out of the question at the present site, they will stay in the New York area to keep in close and intimate contact with their customers and markets.

Much of the data on the early history of the Demuth Glass Works and the views of the old factory was given by Max Schuman, a man now in his eighties, and who has been identified with the factory for over 50 years.

**A section of the laboratory ware lamp working department.**

## GERMANY COORDINATES GLASS RESEARCH

To coordinate German research into glass problems, prevent duplication, obtain the particular investigator best able to pursue a given line of work, are the threefold objectives of a plan of research being carried on in Germany by the Deutsche Glastechnische Gesellschaft. Instituted in 1939, the plan was instrumental in putting 41 investigators at work on 101 projects. The year following, this number had grown to 111 and the investigators to 45.

As is true of all industries in all countries, many individual companies have problems which it cannot solve for lack of trained personnel and adequate apparatus. The Gesellschaft locates such projects, as the first step in its procedure.

Next, it secures the investigator best qualified to do the work. To assign a project to someone who, however well qualified, has no interest in it, is obviously undesirable. So the Gesellschaft locates the worker best available under the circumstances and puts him in contact with the company and the project.

Pamphlets are issued regularly keeping the industry generally appraised as to the projects being studied and the name of the men in charge of the work. Exchange of ideas are encouraged. Considerable of the research is financed by the Gesellschaft.

# THE ZOTOS GLASS-MELTING FURNACE

By GEORGE ALEXANDER ZOTOS
Athens*

**Translator's Note**

**The literary style of this paper suffers severely from the fact that its original author wrote in a language not his own, and with the lack of facility of expression all too common among engineers. Dr. Zotos has what must be regarded as a brilliant and original idea. Unfortunately, his writing lacks frankness. He has something to sell, and this over-shadows the fact that he also has something to describe. For this reason, he has left out many dimensional and structural details which would be of particular interest.**

**The Zotos furnace, although it seems to resemble a rotary kiln, differs in the essential feature of revolving at such a speed that the molten material is held against the lining by centrifugal force in such a way as to have a practically uniform thickness of molten glass against the shell. The speed of rotation is given by Devillers and Vaerewyck (Glass Tank Furnaces, p. 6) as 60 to 100 r.p.m. Calculation from the datum for centrifugal force, which Zotos places as mounting to twice gravity, brings out the fact that the mean internal diameter of the furnace must be approximately 1 meter (40 in.) for a speed of 60 r.p.m. Such a speed for an assembly weighing 32 T. must require an excellent driving mechanism, in addition to the perfect symmetry and balance of the load which Dr. Zotos describes.**

**If the centrifugal force exerted by the glass is twice gravity, it is interesting to note that, as the furnace revolves, the glass at the bottom is under three times gravity while at the top its thrust is equal to its own weight, and at the sides it is twice gravity, with a regular cycle of increase and decrease of thrust during each revolution. This average thrust of twice the actual weight of the glass must, of course, increase the speed of rise of bubbles in direct proportion.**

**It may be a long time before any American manufacturer is persuaded to make the necessary investment for a serious trial of this device. Meanwhile, it must be regarded as a logical, if rather daring, effort to get away from the conventional and notoriously inefficient glass tank.**

During the past twenty years, outstanding progress has been made in the direction of complete replacement of hand labor by mechanical processes in the glass industry. The many-sided problems which had to be solved in order to develop the numerous mechanical processes completely were of great difficulty, but also of high economic importance, because they led to the progress of the modern glass industry. The necessary data of glass technology were sadly lacking, because we lacked experience in the practical application of the special physics of glass. As a consequence of the magnitude and complexity of this problem, other basic problems of the glass industry were pushed into the background.

In particular, the glass-melting furnace remained, up to the present time, a comparatively primitive apparatus. Some effort has been made towards its improvement, without anything essential having been accomplished. We have been seriously concerned over the increasing demands upon the excellence of the melt, in view of the working processes, so that attention to a comparable improvement in the furnace was directed toward the necessary adaptation of the old tank furnace to mechanical operation. The very poor fuel economy of the tank was increased somewhat by expanding the size of the unit. Some success was attained by a great deal of effort in improving the materials of furnace construction in order thereby to reduce corrosion and defective glass. But these developments in furnaces made only a relative degree of progress, up to now. In this connection, it might be remarked that the electrical industry has made recent attempts to develop practical glass melting furnaces. One unavoidable circumstance stands in the way, namely, the fundamental wastefulness of electrical heat as against heat derived from fuel.

Since 1926, I have set about the problem of how to bring into existence a fundamentally better glass-melting furnace. As a newcomer in a large glass factory, I was astounded by the crudity of the glass furnace. However, I was completely unencumbered by the hampering prejudices which placed dampers upon so many other technical men. I thus arrived, after a series of preliminary studies, at a unique solution which seemed to me the most practical in spite of its boldness. I imagined the ordinary tank as though it were rolled around an imaginary axis, and gave my attention to the development of this theoretical picture as a revolving tube similar to a rotary kiln which must revolve at an abnormally high speed. There is thus developed, as a result of centrifugal force, a cylindrical space surrounded by the melt and serving as the combustion chamber, while round about it, in the enclosing glass, melting and refining take place. The furnace wall is in this manner always excluded from the action of the fire, and there also follows, as a result of the peculiar geometry of the construction, an important diminution in the heat loss. It is possible to reach in this fashion a maximum in the heat economy of the melting process that cannot be exceeded in any other type of furnace. Friedmann[1] has not deceived himself in the establishment of the limits of possible furnace development when he envisions this in the enclosing of the fire by the glass melt. In a furnace interior of this sort, we get the maximum utilization of

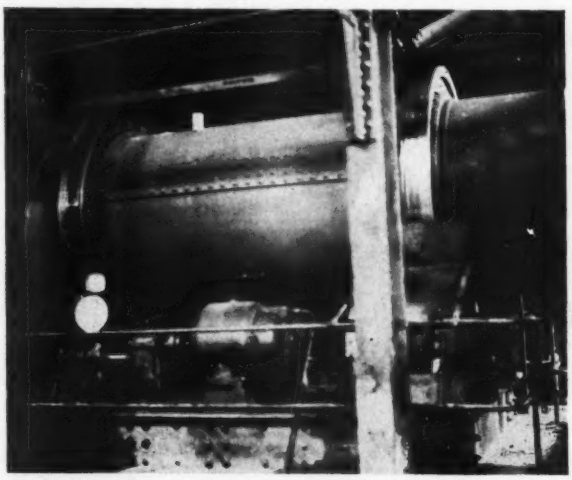


**Fig. 1. A Zotos furnace, side view.**

*Translated by S. R. Scholes

the fire and the most complete absorption of radiant heat because the fire is completely wrapped up in the surrounding melt.

In a series of earlier papers[2], I have had an opportunity of describing actual design and the theoretical bases of my furnace. Also in lectures and in technical sessions the subject has been thoroughly treated[3] so that by and large I must regard the broad details as comparatively well known. People have been unwilling to believe that in a manner so simple theoretically (which in the truest sense of the word reminds us of the egg of Columbus) one could reach so many important advantages for the industry, which in their entirety could have been expected from no other kind of glass furnace. Indeed, important machine shops shrank from the job of building a furnace of this kind.

A certain resistance which I encountered on account of the hesitating attitude of the European industry from the beginning put up to me the difficult problem of carrying through the construction of my furnace system out to the farthest detail, myself, and participating as a leader in the experimental development. Thanks to the influence of a few persons in the glass industry, there are at present several places where practical installations have been built, upon which I can make a brief report.

Before every trial, it was quite clear that a whole series of problems not related to glass technology, but particularly concerned with the mechanical operation, required solution, before the new kind of glass melting technique could be realized in this furnace. Before I go into detail here so far as this publicity is possible in agreement with my supporting firms, I might repeat again a few theoretical fundamentals of my process.

Although the external form of my high-speed tube furnace offers apparently a revolutionary change in the form of the tank, the characteristic features of the latter still remain.[2,4] The length, breadth, and depth of my hollow-cylinder tank in the rotary furnace are equivalent to the corresponding dimensions of the older tank. The essential advantage over the glass tank consists in a complete suppression of the known cross currents in the glass bath and, therefore, of those destructive causes which require correction of the existing ineffectiveness by a lengthening of the plaining time. Moreover, the tube furnace offers the possibility of utilization of the counter current principle in the heating and in the flow of materials. Also, centrifugal force accelerates the release of bubbles. There is automatically attained a shortening of the plaining time and likewise a better primary utilization of the heat in the flame gases in the furnace itself.

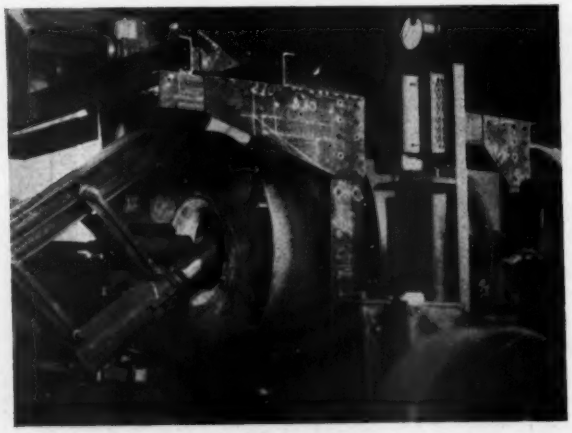


**Fig. 2. Exit tube for molten glass.**

In a series of appropriate J-t diagrams in my paper in the Journal of the Society of Glass Technology[2] I have set forth a number of thermo-technical results. The immediate result of this significant improvement in thermal efficiency becomes evident in the reduction in size of the regenerative system. Thus the new furnace reaches the highest possible thermal efficiency necessarily upon the bases which I have set forth in earlier communications.[5]

Considered mechanically, the high-speed tube furnace forms a homogeneous body rotating without any turbulence or relative internal movement; so that, as a result of these regularities, smooth rotation with minimum power consumption is attained. In continuous operation, by taking special precautions, the desired mechanical stability was obtained without difficulty. Indicative of what can be done for continuous driving is the comparatively small power consumption of 6 h.p. for a tube of about 32 tons weight. Thus the most important and fundamental mechanical problem for a furnace of high efficiency has been solved. Failing in this achievement, any further step toward the realization of high-efficiency furnace technique would be only illusory! A furnace of this kind, built before the final choice of driving mechanism, is shown in Fig. 1.

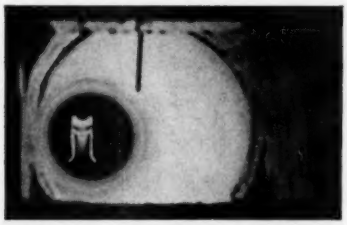


**Fig. 3. Interior view of operating furnace**

From the beginning, I have always visualized one particular application of my furnace system. Since the new furnace principle protects the refractory wall against the high temperature zone, a possibility is thus offered of solving a particular problem of furnace technique. By this I mean the industrial production and control of extraordinarily high temperatures produced by fuel which might range above 2000° C.; that is, such temperatures as would bring the ordinary refractories into the fluid condition. Such temperatures have hitherto been produced either in electrical furnaces on the large scale or in very small laboratory furnaces fired with gas. Therefore, I regard my furnace as the indicated fashion by which these problems can be solved on the industrial scale. For this application, the mechanical problem is less to be feared than the powerful temperature effects which these high temperatures introduce. I scarcely need to recite the known law that the heat radiation effect mounts as a function of the fourth power of the temperature.[5] While the Zotos furnace for lower temperatures (below 1700° C.), in consequence of its great size, was formerly a mechanical problem, as a high

**Fig. 4. Charging and firing end of furnace.**

temperature apparatus it offered me a highly interesting field for research aimed at discovering the thermal and thermo-technical effects in connection with my furnace principle. We thus arrived at experimental results which showed that the heat effects of the simple glass furnace could be rendered quite harmless and controllable.

However, I maintained that the problem offered by a glass melting furnace of high economy is to some extent separate from the problem of the high temperature furnace because the economy of fuel is the primary object in the former; whereas, with the latter, several other factors become important. It remains the primary object of the complete glass furnace to convert the batch rather swiftly into a melt of high quality ready for further working.

The experimental work was conducted with two ends in view: to strengthen the weak places in the process and to introduce definite improvements. It was demonstrated among other things, that during the introduction of the batch certain general rules must be observed in order to avoid the production of defective glass which would otherwise upset the whole procedure. It was further shown that the melting of pure batch proceeds with surprising speed without it becoming necessary to add cullet, if a well-established regularity is observed in the charging. In this way, the batch can be charged without any special preparation such as briquetting. Indeed, experiments with briquetted batch exhibited no remarkable difference.

The withdrawal of the melt is of great importance. In principle this took place in the older construction of my furnace of means of an exit tube which dipped into the melt according to a special adjustment. It is especially important to take advantage of the high speed of the process. However simple this problem may appear when it is stated, the technical adjustments were nevertheless exacting and special studies became necessary.

The further development of my furnace toward complete reconstruction of the present system of glass making is still in progress. It is at present being carried on under my personal supervision only in warring countries. Therefore, any statements concerning certain works still in progress must be limited to the scope of previous reports and illustrated by a few additional pictures of new types of furnaces. Figure 3 shows an interesting inside view of a large glass furnace in full operation, in which the incandescent hollow cylinder may be plainly recognized.

The largest furnace of this kind built as a practical unit has a length of 8 meters. While it became necessary to solve numerous mechanical and construction problems in order to reach this size, it is evident that still larger units could be built with safety, profiting by previous experience, although this has not seemed necessary, thus far.

The rotating speed in normal operation depends upon different factors and lies in practice within a certain range which has been experimentally exceeded at times in order that different effects and destructive influences might be more closely studied. Among the disturbing factors might be mentioned specific critical phenomena which may be described as the formation of waves within the melt and also as vibrations of the mechanical structure of the furnace. Unless special precautions were taken in construction, disturbances of this sort become harmful to the endurance of the shell and cause no little mechanical difficulty. In the usual design of the furnace tube the effect of "fluctuation" must be made useful as well as those phenomena bound up with the principle of the furnace which aid in the homogenizing of the glass, as I have set forth in my Wiesbaden discourse.

The heating of the furnace has thus far been accomplished with either gas or oil. Moreover, it appears that coal dust can be used as a fuel very safely for glasses of the quality of green bottle glass. I have not as yet had an opportunity to demonstrate this method in practice. With oil firing, there is very high heat concentration and a more intense radiation of heat in the combustion space. It is self-evident that in changing from oil to gas firing there must be a different arrangement in the inner zone of the furnace. Gas firing is under all circumstances cheaper, especially in connection with a peculiar process of gas making which was developed for this furnace and the report upon which is still to be given.

Some kind of heat recovery is in general advantageous. Hitherto only recuperators have been used. They have the well known advantage of very uniform pre-heating and the disadvantage of a limited temperature, inasmuch as they have been built of metal up to the present time. I regard it as highly desirable to depart from the present type of regenerators and to build for the furnace a special form of regenerator, definitely suitable for this furnace. In a regenerator of this kind temperatures higher than 1200° C. could be reached for pre-heating, so that, in comparison with the metallic recuperators at a temperature limit of about 700° C. an interval of perhaps 500° C. would become available for additional fuel economy.

Further, it has become evident that a closely-controlled firing system is necesary. This is not so important merely for good combustion as it is much more for keeping the productivity of the furnace at a high level. If it is recalled that in a tank furnace of the old type a considerable volume of molten glass had to be present, amounting to several times the daily yield and thereby

greatly increasing the work of the furnace, it becomes readily understandable that in the Zotos furnace, with its limited volume of glass in the tube, a remarkable flexibility of operation is attained. It is near the actual fact to designate the new furnace as a decidedly dynamic melting principle which stands in somewhat the same relationship to the tank furnace as an airplane to a balloon. The differences and the advantages correspond. Although the increased fiexibility of the new furnace gives rise to a certain sensitiveness which must be taken care of by appropriate precautions in operation, nevertheless it is just this property of the method which leads to remarkable advantages, both in operation and manufacturing economy. For example, when defects in glass arise, the disturbance gets out of the way very quickly. Striking experiments with colored glasses have shown that within a few hours the whole mass of glass inside the furnace tube can be displaced and renewed, and this without interruption of operations.

The fact is of special advantage that surprisingly short thermal cycles appear in the new furnace. The cooling-off and heating-up time up to full melting differs materially from the former experience in the glass industry and amounts only to hours. I can undertake to cool off and re-heat my largest furnace in about 19 hours, and one of the smaller ones in from 10 to 12 hours. When these numbers are compared to the weeks of time in which a tank furnace must be idle, a very definite forward step can be recognized in this property of the furnace, while at the same time no great expansion in size over the units thus far constructed is envisioned. This amazingly short time cycle is of great importance for the glass-melting operation. Even the renewal of the furnace shell represents at most only a few days interruption of work.

The above described advantages arouse expectations of almost uninterrupted connection of forming machine operation with complete glass melting. Individual service of the forming machine is secured through the high flexibility of the furnace. Although this condition seems already fulfilled by the modern tank surface, no one has yet succeeded in any proportionally small tank furnace in reaching that economy of fuel which is possible only in the larger tanks, for example, for flat glass production. On the other hand, on the basis of the new furnace, even the smaller units could reach a fuel economy exceeding that of the largest tank surface, and probably of the order of less than 0.2 T. of coal per T. of melted glass. It is clear that although no essential increase in size of the furnace unit is contemplated, it has already reached a high degree of efficiency.

It becomes of greater importance to develop the proper size and arrangement of the furnace to suit the operation in hand, while retaining the same type and high fuel economy already demonstrated. The standardization of the furnace according to medium-sized units offers advantages for larger and smaller operations, and makes possible the maintenance of low operating costs. In large operations, the complete mechanization of charging demands that the single furnace tubes must be connected and served by travelling cranes. In this manner, there could be reached without difficulty 350 working days in the glass factory each year. It is also quite possible to keep the cost of a standby unit tube in an installation of this kind much lower than the investment cost in tank furnace operation.

The development of the anticipated high temperature furnace formed the subject of my special report[6], in which I had already made a clear picture as to the utility of this application.[7] For the glass industry, the high-temperature furnace is of special interest in so far as it is able to make high-grade refractories by melting and casting. Previous experiences have shown that cast tank blocks have better properties because those reducing influences which are always present as a result of the carbon electrodes of the electrical furnace are done away with. The blocks are accordingly light-colored and do not color the glass.

A high-temperature furnace of this sort is shown in Fig. 4. In operation, melting temperatures over 2200° C. have been reached, and I have plans for quite new methods of firing which should make for economical heating in these operations. The new heating process already described in connection with my furnace has been developed so practically that in a specially constructed generator using medium-grade coal, even coal high in ash, a producer gas of high heat value can be developed. When we compare the economy of the high-temperature furnace with that of the electric furnace we arrive at surprisingly satisfactory figures, which, in view of the products obtained, exceed all previous processes. The melting cost in the Zotos furnace in European results is only one-half to one-third the cost of electrical operation. These facts open the way to a new industry.

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[1]Dr-Ing. W. Friedmann, Glastechnische Berichte 9, 1931, S. 551
[2]G. A. Zotos, Trans. of the Soc. of Glass Techn. Vol. 16, 1932
[3]G. Zotos, Glastechnische Berichte, 12, 1934, S. 423
[4]G. Zotos, Rev. de Metallurgie, Paris 1930, S. 352/360
[5]G. Zotos, Die Glashutte, Dresden 1935, S. 207
[6]G. Zotos, Rundschau techn. Arbeit 1937, No. 18, S. 7
[7]G Zotos, Feuerungstechnik, Jahrg. 20, Heft 9, 1931.

## N. J. SENATE APPROVES WPA GLASS PROJECT

Producers of hand made glassware are familiar with the WPA glass project in South Jersey. Its purpose was to take glassmen off the relief rolls and put them to work at their own trade as glassmen. An account of the project was published in THE GLASS INDUSTRY, for September, 1940, with illustrations of some of its more interesting ware.

During the month of June, specimums of what WPA describes as the new Wister ware were on exhibition in the Capitol building, in Trenton, N. J. This prompted the Senate of New Jersey to commend the Works Project Administration in the following resolution:

BE IT RESOLVED BY THE SENATE OF THE STATE OF NEW JERSEY:

WHEREAS, South Jersey, the cradle of the American Glass Industry, is once more making available its distinctive type of historic glassware, through the New Jersey WPA Arts and Crafts Project; and

WHEREAS, the WPA project has arranged a beautiful display of these hand-blown glass objects in the Rotunday of the State Capitol; and

WHEREAS, WPA is reviving and saving for future generations the skill and craft secrets of these artisans; therefore.

BE IT RESOLVED, That the Senate of the State of New Jersey request the members of the Legislature and citizens of the State to visit this beautiful exhibit to review the artistic objects show nand become interested in the revival of this fine phase of New Jersey culture.

## THE GLASS MAKING SITUATION

(*Continued from page* 388)

laying in their supplies, or else are not wholly sincere in their report. Some claim serious trouble; others are seemingly unaware that there is a problem.

Perhaps the following letter to THE GLASS INDUSTRY from a large manufacturer of shipping containers will throw some light on the matter. We quote in part:

"Generally speaking, we believe we will be able to continue to take care of all of our glass manufacturing customers with reasonable satisfaction. However, this entails cooperation on the part of the glass manufacturers in anticipating their requirements and placing orders well in advance.

"This statement does not hold true for all our customers in other lines, because we are having difficulty taking care of the enormous demand. The situation is aggravated by a shortage of wood pulp and paper making capacity, which is not sufficient to keep our fabricating plants running 100 per cent. As a result, we have had to prorate some of our customers and delay a lot of deliveries.

"We have not taken on any new customers . . . and deliveries to old customers should improve. . . ."

Another manufacturer states: "The container industry, although oversold at the present time, has enough capacity to take care of civilian requirements based upon 1940 volume, with perhaps a small increase. . . ."

Direct effects of the container shortage have been to compel manufacturers of hand made and table ware to go back to barrels. The container industry is packing in larger units; for example, milk bottles in three dozen lots instead of two dozen. Great help to the general container problem resulted from the U. S. Treasury relaxing its specifications on the interior packing of Bottled in Bond Whiskies. This saved between 12 and 1500 tons of interior packing. Plate and flat glass companies have experienced trouble with wooden containers and with packing papers.

### Molds

The problem of molds is, of course, a problem of metals. The metals involved vary from common cast iron to the rarer non-ferrous elements. Alloyed molds have either a cast iron or copper base, to which must be added aluminum, chromium, manganese, cobalt, vanadium, zinc, or nickel. These metals in varying combinations produce practically any glass mold. The non-ferrous metals are becoming scarcer, especially manganese, chromium, and aluminum. All are on priority. Unless priorities are extended to glass, it is not impossible to imagine the time when all glass molds will have to be made of non-alloyed iron.

Because the mold industry is identified so completely with the metal situation, the mold maker is decidedly on the spot. In overcoming his difficulties, he has received full cooperation from the glassmen, particularly the container manufacturer. This latter group has brought full pressure on customers to limit the amount of new molds, and confines its mold making so far as possible to repairs and replacements.

Glassmen have fared very well so far with respect to molds. Few, if any, have been unable to obtain their absolute necessities; though deliveries have been uniformly late. Trouble can be avoided by placing orders well in advance of requirments.

### Machinery and Equipment

Here again we run into the metals problem. Hardly with an exception, manufacturers of glass machinery and equipment are having the utmost difficulty obtaining metals. For instance, take the construction of lehrs and furnaces: Tubing, insulation, steel, electrical equipment, gears, transmissions, are needed, to list only a few of the requisites. Temperature control instruments are just not to be had. Or take the plight of those who are changing their fuel from gas to oil: Adapting their furnaces to the new type of fuel requires pumps, motors, etc., which it is almost impossible to obtain. While in some cases, priorities may be obtained, yet the rating is so far down the line as to require 12 to 15 weeks to secure delivery. All suppliers are specifying delayed delivery dates, and one large manufacturer of glass making machinery reports it is sold out completely for the next 12 months.

### Labor

Generally speaking, labor has not presented a serious problem so far. Losses to the higher paid defense industries have occurred, but these losses have been localized and replacements of a sort have been obtainable. About half the replies to THE GLASS INDUSTRY questionnaire stated that a let-down in the quality of the workmen had been noticeable.

The handmade lines appear to be bothered most. There has been no apprentice system worthy of the name for many years. Skilled labor is almost non-existent. Writes one plant owner: "This business has gone to hell for so many years that skilled workmen have not been attracted to it. Cheap labor suffers from the competition of the defense industries, and as there is a definite ceiling to the price of this type of glassware, producers cannot match the wage scale of the defense manufacturer for common labor."

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## DR. LITTLETON AGAIN IN AUTO WRECK

Dr. J. T. Littleton, assistant director of research at the Corning Glass Works, and Mrs. Littleton, sustained severe body injuries as the result of an automobile accident near Hammondsport, N. Y., on August 27. Dr. Littleton fractured his pelvis and breast bone. Mrs. Littleton's right leg was broken and she has been under observation for chest injuries. Both suffered considerably from shock.

When word of Dr. Littleton's injury spread through the glass industry, particular concern was felt over his condition since he had not yet fully recovered from a former accident in an automobile in 1936. At that time too his pelvis was broken and internal injuries nearly cost him his life. However, Dr. W. C. Templer of Corning, who attended him after the recent mishap, reports that the broken bones have set cleanly and that his patient is progressing nicely.

Dr. and Mrs. Littleton have been spending the summer with their family at their home on Keuka Lake. He was on his way to his office at Corning when the accident occurred. Both of the sons were in the car. Jesse Jr., received severe bruises but Harvey escaped without injury.

# INVENTIONS AND INVENTORS

## A Summary of United States Patents of Interest to the Glass Industry Issued During July

### Furnaces

Only in the most recent years has there been any attempt to improve on the time-honored flat bottom melting furnace, but much study is now being given to this subject. This comes as a result of the several publicly reported projects, and no doubt even more numerous private investigations, which show that there is much dead space below the melting surface which often leads to trouble. Thus a change in operating method or in batch composition, however slight, may abnormally disturb the glass near the furnace bottom and cause difficulties which are not easily diagnosed. Figure 1, an illustration from James E. McBurney's patent 2,249,714 (Owens-Illinois Glass Co.), shows a modified tank in which glass flow lines have received consideration. The melting section receives batch at both ends (from doghouses 10) where the hearth has its maximum depth, and discharges it through one sidewall into a separate refining furnace. The melting furnace is shallow through the middle at the discharging position and the refining furnace is deepest where the spout discharges into it. The melting and refining chambers are each fired by a single pair of burner ports firing across their length rather than their width.

Rotary electric furnaces for glass melting were described in three 1935 patents obtained by John Ferguson of Cleveland (2,006,947; 2,007,755; 2,008,495). An extension of these ideas is illustrated in a fourth patent 2,250,155 which issued July 22. The rotary furnace of Figure 2, turns on ball bearings 15; a number of electrodes 30 are held in an annular ring which extends around the furnace at its greatest diameter; just above the electrode ring, a plate 20 divides the furnace into upper and lower chambers, completely separated except for the stack vent 27 and charging holes 25 next to the furnace lining. The operating technique is especially interesting in connection with the method of starting the furnace. A small quantity of cullet is first charged through the stack. The furnace is then operated at a greater than normal speed so that the cullet will be thrown by centrifugal force into the ring space which holds the electrodes. A gas or oil burner is then inserted through the bottom opening which would normally be the glass discharge opening. When the furnace has become hot enough to melt the cullet, there will be a continuous ring of molten glass connecting the electrodes, and serving as a path for the electric current. The burner may then be withdrawn and normal operation begun. Batch materials are supplied through the hopper 28 into the upper zone of the furnace from which they flow down the walls as soon as partially melted by heat from the underlying electrodes. Due to the centrifugal force of the rotating furnace this glass piles up in the electrode ring; when speed is reduced to normal, it flows down the side of the furnace in a thin layer as indicated by the dashed line inside the furnace. The glass is drawn off from the bottom of the furnace for any intended purpose.

One of the Games Slayter electric furnace patents (2,212,528; Owens-Corning Fiberglas Corp.) which was discussed in the October 1940 THE GLASS INDUSTRY, has been reissued (21,863) with nine additional claims.

### Feeding, Forming and Shaping

Bottle machines are described in patents 2,249,709 (John R. Hoge of Toledo) and 2,251,010 (Russell G. Allen of Alton, Ill.), both assigned to Owens-Illinois Glass Co. The Hoge patent is recommended as worthwhile reference reading to those who may wish an elementary discussion of the importance of timing on the various stages of the pressing cycle which involve the release of the parison by the blank mold and its inclusion in the finishing mold. Improvement in these features is one of the objects of the patent. The Allen patent provides a throttle valve installed in the blowing system of a suction forming machine in such a way as to initially admit air gradually to the blank, then to terminate air feed momentarily to allow the introduced air to expand

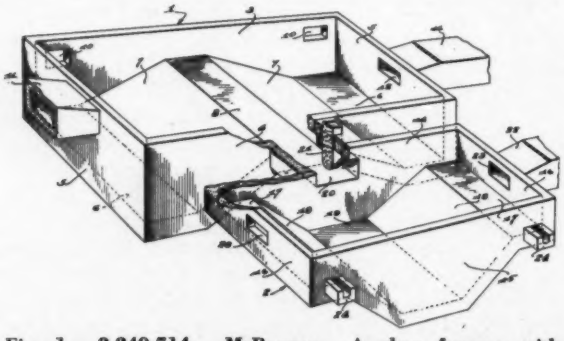


**Fig. 1. 2,249,714: McBurney. A glass furnace with melting chamber having a sloping hearth with the most shallow section at the sidewall discharge point.**

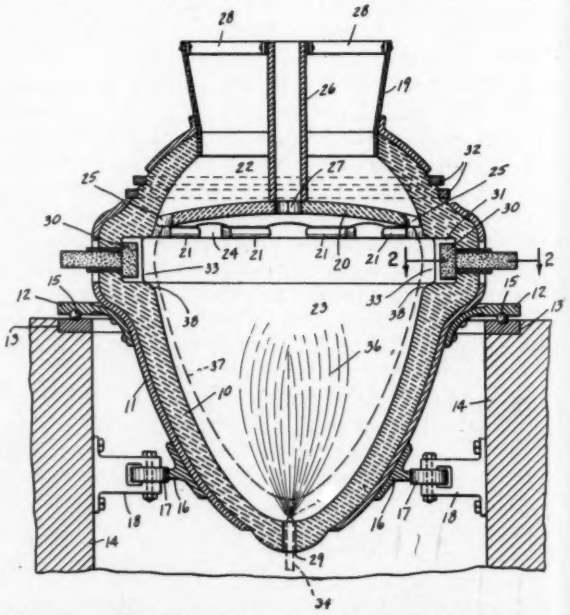


**Fig. 2. 2,250,155: Ferguson. A rotary glass furnace in which centrifugal force holds the glass as a thin layer against the furnace wall.**

endothermally, and finally to admit air under full line pressure to expand the blank to final form. The dwell in the cycle has been found to strengthen the shoulder sections of bottles which are frequently weak.

In the shearing device described in patent 2,250,110 by Peter Kucera of Allison Park, Pa., the gob is severed by the action of flame jets acting from opposite sides at slightly different levels as would be the case in any normal shearing action. The burners are in semi-circular form. As they approach the glass issuing from the orifice, the speed of the burners increases and the flame pressure increases.

Figure 3 illustrates the glass feeder of patent 2,249,371 granted to Samuel E. Winder of Baltimore (Crown Cork & Seal Co. Inc.). The feeder tube 20 with opening 21 which maintains the glass level 22 within the tube, has an outlet pipe from the top which may automatically be connected alternately with vacuum and with atmospheric air pressure. Only two inches of vacuum are used, this being enough to retract the stub when the shears sever a gob. The period of vacuum is followed by return to normal air pressure which causes another gob to flow from the orifice.

Josiah H. Williams of Baltimore received patents 2,247,424 and 2,250,515 for glass gathering devices utilizing a series of punties or gathering rods operated as a group by a single operator.

Elmer H. Haux of Tarentum, Pa., reports in patent 2,251,130 (Pittsburgh Plate Glass Co.) that molten glass, such as cellular glass, will have less adherence to metal or refractory mold walls, if the latter are treated with a slip-coating consisting principally of yellow ochre or other ore.

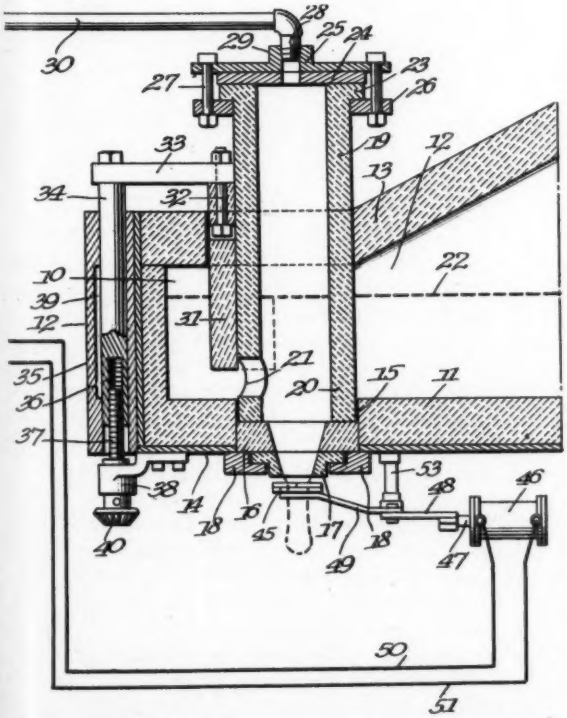



**Fig. 3. 2,249,371: Winder. Gravity feeder with severed stub withdrawn by vacuum.**

## Miscellaneous Processes

Wm. O. Lytle of New Kensington, Pa., assigned to Pittsburgh Plate Glass Co. his patent 2,251,144 for a means of applying two different colored layers of glaze to the same surface of a glass article. A layer of colored frit of comparatively high melting point is applied to a newly formed sheet of glass while it still contains enough residual heat to melt the frit, and then, immediately a second layer of lower melting point is applied over the first, this layer also being melted by residual heat. In a second patent (2,248,714) Mr. Lytle applies a decorative frit to a plate of glass and then carries the plate in horizontal position through a chamber where the top of the plate is brought to such a temperature as will fuse the vitreous color, while the bottom of the plate is chilled.

Methods of sealing glass tubes or bulbs were covered by General Electric Co. in patent 2,248,647 to Royal F. Strickland of Cleveland Heights and 2,248,644 to Martin Reger of Berlin-Charlottenburg and Hans Jancke of Berlin. The Strickland patent describes a method of sealing a bulb filled with high pressure gas, by pinching the exhaust tube between heated jaws which are prevented from sticking by a graphite coating applied to the tube.

A cutter for glass tubes is described in patent 2,250,159 granted to Russell S. Grube of San Jose, Calif.

Patent 2,248,376 assigned by James E. Moore of Los Angeles to Maywood Glass Co., Maywood, Calif., describes a transfer apparatus for moving articles from a single file conveyor to a multiple file conveyor such as a lehr belt.

A machine for fire-polishing glass ware was detailed in patent 2,248,430 to Albert B. Knight of Fairmont, W. Va., who has earlier patents in the same field. The ware is moved on a chain conveyor between batteries of burners which can be adjusted by universal mountings to the size and height of the ware. This adjustability of burners in all directions is a major feature of the machine.

## Plate and Sheet Glass

In a month which saw an abnormal number of new patents on plate and sheet glass, the preponderant share was issued to Pittsburgh Plate Glass Co. inventors. Owen's patent 2,251,160 is of particular interest. As illustrated in Figure 4 he has devised a tempering or case-hardening apparatus in which glass sheets are carried vertically between two heat-resisting metal conveyor screens 23 and 24 which support the plates on cleats. This would dispose of the familiar method by which the plates are suspended in the furnace atmosphere by gripping tongs. The sheets are heated for tempering by heat-

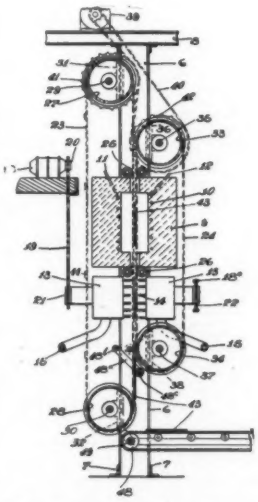


**Fig. 4. 2,251,160: Sheet tempering apparatus with vertical movement of sheets.**

ing elements 10 and are quenched by air blast nozzles 14. Mr. Owen claims that very thin sheets can be case-hardened by this method since the sheets are kept from deformation by the metal screens.

The advantage of the screen type of support for sheets during tempering is pointed out more definitely in patent 2,251,106 to Mr. Owen's associates Lloyd V. Black and Gerald Z. Minton of Tarentum, Pa. They state that the usual edge suspending method can be satisfactorily applied without deformation if the sheet is not less than one-fourth inch thick. For sheets as thin as one-eight inch which would deform if solely edge-supported, they provide metal screens for both sides of the sheet and apply some tension to them horizontally and vertically to support the sheet against deformation.

In 2,251,159, a patent concerned with bending and tempering sheets, Wm. Owen provides a metal supporting plate which is free to bend with the vertically hanging sheet. The plate carries the gripping devices which support the sheet from its upper edge. The bending force is applied both to the sheet and to the metal plate.

A British inventor, Lewis Jex-Blake Forbes of St. Helens, England, in patent 2,250,628 (Société Anonoyme des Manufactures des Glaces et Produits Chemiques de Saint-Gobain) also proposes to support sheets in such a way that the supporting grips can move into a curved plane when bending forces are applied to the sheet being tempered. Instead of deforming the support, as does Owens, Forbes places his tong supports on rollers so they may move and pivot in the required direction.

The short sections of stranded wire cable used as abrading elements for cutting plaster of Paris from plate glass polishing tables wear away rapidly due to the spreading of the strands. James G. Haworth of Toledo, in patent 2,248,232 assigned to Libbey-Owens-Ford Glass Co. attacks this problem by arranging the cable sections in the multiple unit of Figure 5, which can be inverted to provide fresh ends when wear requires it. He reports that a rubber sleeve 52 slipped over the cable is also helpful.

Patent 2,248,702 to John H. Fox, Robt. A. Miller and Wm. O. Lytle (Pittsburgh Plate Glass) concerns a laminated product containing layers of metal, wood and glass.

The technique of providing a colored layer within a sheet of colorless glass, by releasing the colored glass below the surface level near the drawing point, is familiar to those who have followed recent patents issued to Pittsburgh Plate Glass Co. inventors. In the latest variant of this idea (Arthur D. Nash 2,248,717) steam is released from a channel just under the meniscus of a vertically drawn sheet. The numerous gas bubbles trapped within the sheet are said to give a translucent product suitable as a substitute for sand blasted plate.

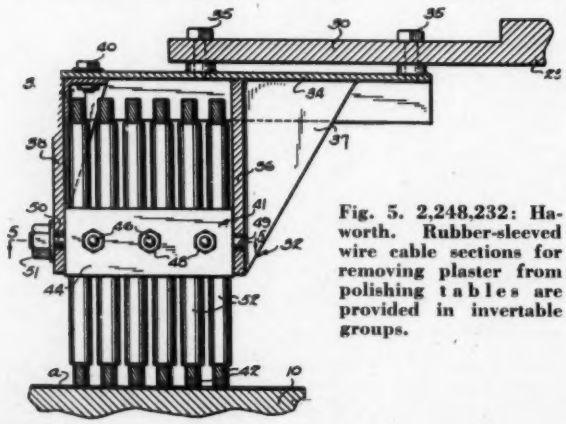



**Fig. 5. 2,248,232: Haworth. Rubber-sleeved wire cable sections for removing plaster from polishing tables are provided in invertable groups.**

Edge grinding apparatus is described in patents 2,248,263 to Carl B. Williams of Toledo (Libbey-Owens-Ford Glass Co.) and 2,248,143 to Karl Weber of Los Angeles (Weber Showcase & Fixture Co. Inc.).

## ANNOUNCES NEW CONFERENCE ON GLASS PROBLEMS

Plans are being made for the Sixth Conference on Glass Problems to be held under the joint auspices of the Department of Ceramic Engineering, University of Illinois, Urbana, Illinois, and the Chicago Section of the American Ceramic Society. The meetings will be held at the University on Friday, November 7, and Saturday, November 8.

In addition to the program of the meetings, which will be of the usual excellence, there will also be the opportunity for those in attendance to enjoy the diversion of witnessing the Iowa-Illinois football teams in action on the Saturday afternoon.

## OPTICAL SOCIETY TO MEET

A symposium on the role of "Optics in the National Defense" will feature the annual meeting of the Optical Society of America, to be held at the Hotel Pennsylvania, New York, October 24 and 25. The program of the annual meeting calls for the presentation of contributed papers at both afternoon sessions, the symposium on Friday morning, and the annual dinner Friday evening. Three other national societies, with overlapping memberships, will hold their meetings at the same time and place: The Society of Motion Picture Engineers, The Acoustical Society of America, and the Society of Rheology. A joint luncheon of all four societies has been scheduled for Friday noon. Meetings will be open to non-members.

## OCTAVE JACQMAIN

Octave Jacqmain, plant manager of the Harding Glass Company in Ft. Smith, Arkansas, died August 12 in a Ft. Smith hospital at the age of 68. Mr. Jacqmain came to this country at the age of eight with his parents, who were members of an old glass-making family in Belgium. He returned to Belgium for four years, from 1921 to 1925, however, and made another protracted visit abroad when he worked on a modernization program at a glass plant in England owned by Lord Beaverbrook.

Mr. Jacqmain's death came at a time when he was extremely active on an extensive modernization program at the plant, which is scheduled to involve the expenditure of approximately $750,000 this year and make it a show place of the country's glass industry. A feature of this program is a fireproof concrete and steel cutting room, 82 x 488 feet, three stories. Part of this program has already been completed, including erection of a balloon water system of 100,000-gallon capacity, a water-cooling system and a 200-foot brick smokestack.

# CURRENT STATISTICAL POSITION OF GLASS

During July the glass industry maintained the record production rates established in May and June; there was little evidence of the usual seasonal decline as employment and payrolls held their previous month's high levels. According to THE GLASS INDUSTRY's Production Index, the July output totalled $39,000,000 which was 40 per cent greater than last year's comparable figure; during the first 7 months of this year glass production amounted to $256,000,000 as compared to $202,000,000 in 1940's corresponding months.

**Plate glass** production during July totalled 12,463,412 square feet according to the Plate Glass Manufacturers of America. This was 32 per cent less than June's volume but exceeded July 1940 by 47 per cent. During the first seven months of this year, plate glass output amounted to 112,016,000 square feet.

**Window glass** production during July totalled 1,280,777 boxes, which represented 78.9 per cent of the industry's total capacity. This was 2 per cent less than the June figure but was 19 per cent greater than in July 1940. During the first seven months of this year window glass output amounted to 9,642,000 boxes, which was 27 per cent above last year's level.

**Glass container** production during July totalled 6,290,554 gross according to the Glass Container Association of America. This was slightly more than the industry record set in May and was 31 per cent greater than 1940's corresponding total. During the first seven months of 1941 a record total of 38,040,672 gross glass containers were produced, 21 per cent more than in 1940's comparable period.

Shipments of glass containers during July amounted to 6,363,209 gross, 6 per cent below the June total but an increase of 41 per cent over July 1940. Compared with last year's corresponding figures, shipments of pressed food ware and narrow neck containers were up 53 per cent, pressure and non-pressure ware 51 per cent, beer bottles and medicinal and toilet ware 42 per cent, general purpose ware 40 per cent, milk bottles 34 per cent, domestic fruit jars and jelly glasses 32 per cent, and liquor ware 31 per cent. During the first 7 months of this year, shipments increased 26 per cent over last year to 38,769,555 gross—a new record. All lines moved in greater volume with the largest percentage increase reported for domestic fruit jars which were up 72 per cent; other gains ranged from 14 per cent to 38 per cent.

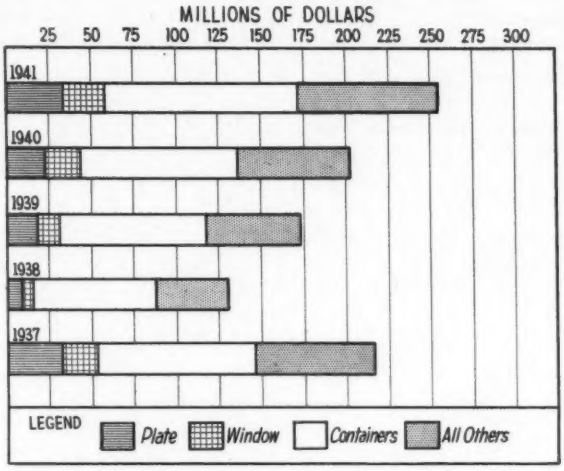
Inventories of glass containers as of July 31, 1941, totalled 8,176,269 gross, or 12 per cent below last year's level. Stocks of all types of ware were lower, with the exception of beer bottles which were up 31 per cent. Declines ranged from 7 per cent to 40 per cent.

**Miscellaneous glass products** manufactured during July had a value of $13,000,000; this compared with $9,000,000 in July 1940. During the first 7 months of 1941 production of this branch of the industry totalled $84,000,000—31 per cent greater than last year's comparable total.

Machine made tumbler production during July amounted to 4,540,867 dozens, which was 26 per cent greater than in 1940's corresponding month. During the first 7 months of this year, tumbler output totalled 29,879,312 dozens, 14 per cent above last year's level.

## THE GLASS INDUSTRY'S INDEX

**Production: Seven Months, January Through July**




## CURRENT GLASS CONTAINER STATISTICS

(ALL FIGURES ARE IN GROSS)

| Types of Ware | Production July, 1941 | Production July, 1940 | Shipments July, 1941 | Shipments July, 1940 | End of Month Stocks July, 1941 | End of Month Stocks July, 1940 |
|---|---|---|---|---|---|---|
| Food Containers | 1,937,413 | 1,451,753 | 1,839,273 | 1,282,172 | 1,972,432 | 2,282,899 |
| (Narrow neck, wide mouth and pressed) | | | | | | |
| Pressure and Non-Pressure Ware | 605,564 | 440,290 | 690,943 | 465,505 | 478,846 | 584,269 |
| Beer Bottles | 442,302 | 351,928 | 495,435 | 357,801 | 640,095 | 514,314 |
| Liquor Ware | 887,152 | 764,546 | 833,611 | 620,280 | 1,346,816 | 1,398,127 |
| Medicinal and Toilet Ware | 1,563,859 | 1,187,807 | 1,602,538 | 1,128,761 | 2,654,959 | 3,144,268 |
| General Purpose | 384,340 | 308,227 | 398,479 | 283,311 | 465,420 | 575,306 |
| Milk Bottles | 294,032 | 197,622 | 277,609 | 207,235 | 295,015 | 335,102 |
| Fruits and Jellies | 147,914 | 41,240 | 200,190 | 151,808 | 282,880 | 461,475 |
| All Others | 27,978 | 19,383 | 25,131 | 17,779 | 39,806 | 35,090 |
| Total Industry | 6,290,554 | 4,762,796 | 6,363,209 | 4,514,752 | 8,176,269 | 9,330,850 |

Shipments during July increased 22 per cent over July 1940 to 4,382,017 dozens, bringing the January-July total 16 per cent ahead of 1940's comparable period to 29,756,297 dozens. Stocks on hand July 31 amounted to 7,899,400 gross which was 4 per cent more than last year's corresponding figure.

Manufacturers sales of machine made table, kitchen and household glassware during July were reported to have totalled 2,903,142 dozens or 39 per cent more than a year ago. For the 12 month period ending July 31, 1941 this trade amounted to 377,085,418 dozens or 9 per cent more than last year's total of 33,947,346.

**Employment and Payrolls:** June's employment rate of 86,000 persons was maintained by the glass industry during July; this compared with 71,400 persons in last year's corresponding month.

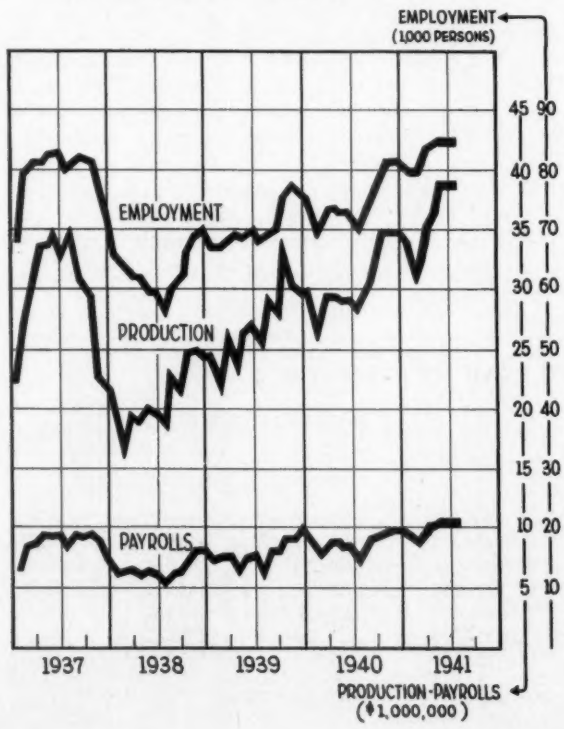
Payrolls in the glass industry during July about equalled the June figure of $11,000,000; in July 1940 this payroll was estimated at $7,500,000. During the first 7 months of 1941 glass manufacturers paid out about $72,500,000 in wages as compared to $57,500,000 last year.

**Foreign Trade:** Exports of glass and glass products totaled $1,410,000 during June, according to official figures released August 22nd by the Department of Commerce. This was a decrease of 25 per cent from the May total but exceeded June, 1940, by 26 per cent. Decreases from the previous month were reported for all types of ware, with plate glass down to 24 per cent, window glass 20 per cent, containers 29 per cent, tableware 30 per cent, and illuminating ware 31 per cent. Comparison of this trade with last year's corresponding month shows that tableware dropped 29 per cent, and that plate glass and illuminating ware were both off 14 per cent, while window glass shipments were more than four times last year's volume, and containers increased 48 per cent. During the first half of this year, shipments of glass products to foreign markets totaled $10,017,000, as compared to $6,075,000 in last year's comparable period.

Imports of glass and glass products during June increased 26 per cent over May's total to $118,000; this, however, was 36 per cent less than in June, 1940. During the first six months of 1941 imports amounted to $678,000, as compared to $1,438,000 last year.

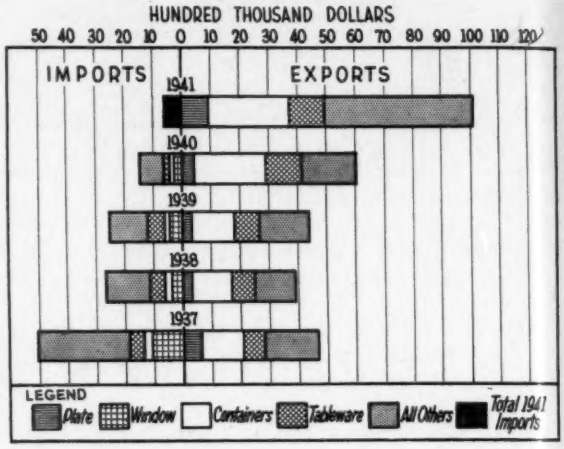
## THE GLASS INDUSTRY'S INDEX

**Monthly Trends Through July, 1941**




## THE GLASS INDUSTRY'S INDEX

**Foreign Trade: Six Months, January Through June**




FOREIGN TRADE STATISTICS

(Values in $1,000)

| *Exports* | *June* 1941 | *May* 1941 | *June* 1940 |
|---|---|---|---|
| Plate | 124 | 163 | 145 |
| Window | 145 | 194 | 35 |
| Containers | 433 | 594 | 292 |
| Tableware | 167 | 238 | 234 |
| Illuminating ware | 56 | 81 | 65 |
| All other | 485 | 612 | 282 |
| Total | 1,410 | 1,882 | 1,053 |
| *Imports* | | | |
| Total | 118 | 94 | 185 |

### JOINS BATTELLE MEMORIAL STAFF

Paul T. Talbott, ceramic engineer, has joined the research staff of Battelle Memorial Institute, Columbus, Ohio, and has been assigned to the division of ceramic research.

Mr. Talbott is a graduate of the University of Illinois. Previous to joining the Battelle staff he was associated with the Cerro de Pasco Copper Corporation, Peru, South America, as an experimental engineer. He is a member of the American Ceramic Society.

*An open letter . . . .*

# TO USERS OF MATHIESON DENSE SODA ASH

★★★★★★★ ★★★★★★★

● The demand for many of our products for both direct and indirect national defense purposes has been greatly in excess of anything we had anticipated. In some cases, this greatly increased demand has made it impossible for us to take care of our customers' normal requirements. But in all such cases we are meeting the unusual conditions to the best of our ability.

We realize the serious problem that has been created for many users of Mathieson Dense Soda Ash by this emergency curtailment, and we are doing everything we possibly can to ease the situation. We are using this "open letter" as one way of asking our customers to bear with us during this emergency period.

Your business is appreciated. Your acceptance of Mathieson Dense Soda Ash has spelled the success of this product. Your orders are being filled as rapidly as the priority of defense deliveries will permit. And in the meantime we ask that you do not order more than you would ordinarily need for minimum current requirements.

★★★★★★★ **THE MATHIESON ALKALI WORKS (INC.)** ★★★★★★★

**60 EAST 42ND STREET, NEW YORK, N. Y.**

SODA ASH . . . CAUSTIC SODA . . . BICARBONATE OF SODA . . . LIQUID CHLORINE . . . BLEACHING POWDER . . . HTH PRODUCTS . . . DRY ICE
AMMONIA, ANHYDROUS and AQUA . . . FUSED ALKALI PRODUCTS . . . SYNTHETIC SALT CAKE . . . CARBONIC GAS . . . SODIUM CHLORITE PRODUCTS

# NEW EQUIPMENT AND SUPPLIES

• The Tillotson Clay Products Co. has changed its name to the Refractories Corporation. Main offices are located at 3363 Fruitland Road, Los Angeles.

### ANNOUNCES COLORED PERMOCHARTS

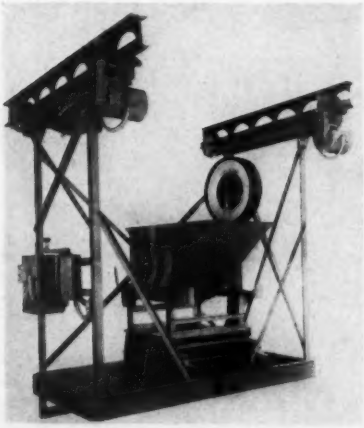
The Permochart Company, Sewickley, Pa., announces production of the I-EZ (eye-ease) Permochart, a recently improved design of recording instrument chart made for continuous re-use. The new I-EZ Permochart is made in three colors of "Vinylite" plastic, so colored and shaded as to reduce glare and eye-strain to a minimum. The three colors, green, ivory and blue, can also be used to advantage in identifying different units or operations.

Like the white Permochart, colored I-EZ charts are made for all types of recording instruments using circular charts. Permocharts are non-inflammable, oil, gasoline and grease resistant, and entirely waterproof. No meter changes are required, as these charts are affixed and removed in the same manner as paper charts. The same pens are used, and any of the regular recording inks provide satisfactory contrast for good record visibility. The ink record is easily removed from the chart surface with a damp cloth, after which the chart is ready for re-use.

### TRAVELING BATCH SCALE

A traveling batch scale car has been developed by the Cleveland Tramrail Division of The Cleveland Crane & Engineering Company, Wickliffe, Ohio. It is particularly suited for the handling of chemicals and batch materials.

The car is motor driven and controlled by an operator who rides on the platform space (see illustration) to the left of the bucket. A variable speed drum controller permits the car to be traveled at any speed up to 300 feet per minute. Double overhead rails make it possible to straddle overhead bins so that their chutes may be brought close to the car bucket. The bucket is emptied by tilting through use of a crank wheel.



### NEW MODEL 110 POLARISCOPE

The Polarizing Instrument Company, New York, has just announced a new model 110 glass strain testing polariscope. In the new model the housing is made of aluminum with air vents provided for the dissipation of heat by convection. In addition to this the upper half of the housing is completely fitted with fins so that some of the heat is disposed of by radiation. By heat dissipation both by convection and radiation, the unit is said to operate at a lower temperature than did the old model which employed a motor and fan in a sheet metal housing. The main deficiency of the old type of heat reduction was that the small fan motors easily got out of order and presented the owner with an inconvenient repair problem. More important than this is the fact that today these motors are on a priority basis and are difficult to obtain.

The problem of ring section examination was difficult with the old model, and in this sense the polariscope was incomplete. Now added to the standard accessary equipment is a microscope which has been optically designed primarily for this type of work. This will be offered as an accessory unit and will be available in the form of additional equipment.

• F. Cecil Baker has been elected president of the American Potash & Chemical Corporation, succeeding H. S. Emlaw, who continues as a director and member of the executive committee. The corporation also has elected three new vice presidents: R. W. Mumford, Peter Colfax and W. J. Murphy. Mr. Murphy will have charge of sales.

### MICHIGAN ALKALI MOVES

The Michigan Alkali Company consolidated its general sales and executive offices on August 15 and moved them to the Ford Building, Detroit. An eastern branch will be maintained at 60 East 42nd Street, New York City. Other branches are located in Chicago, Cincinnati and St. Louis.

• The Foxboro Company, Foxboro, Mass., announces a new address for its Cincinnati office, which hereafter will be located in Room 607 of the American Building, Walnut Street and Central Parkway. The telephone is Main 4872.

### CATALOG & BULLETIN SERVICE

*Current catalogs and manufacturers' service bulletins reviewed in this department may be obtained by writing to THE GLASS INDUSTRY.*

### CATALOGS RECEIVED

*The Bristol Company, Waterbury, Conn.* Catalog 4050 contains 32 pages of engineering information on the theory and practice of automatic control of temperature, pressure, vacuum, flow, flow ratio, draft, absolute pressure, humidity, liquid level, p.H. value, and time program. Liberally illustrated. Special attention is given to the Free-Vane principle of air control.

*S. G. Frantz Co., Inc., New York, N. Y.* Bulletin 20 describes the company's line of Ferro-Filters. These magnetic separators remove fine iron and steel particles too small to be caught by screws, filters, separators and other conventional purifying devices.

*Pangborn Corporation, Hagerstown, Md.* Bulletin 907 describes the new Pangborn Unit Type Dust Collector family. Six pages, with many illustrations.

*The B. F. Goodrich Company, Akron, O.* A 12-page catalog section Goodrich Vibro-Insulators. Illustrated with installation pictures and engineer's drawings of each type of Vibro-Insulator. Methods of selecting the proper Vibro-Insulator are given, together with methods of mounting, and discussions of uniformity of load distribution, rocking and horizontal motion, and the care of these devices.

*Lamson Corporation, Syracuse, N. Y.* "Wings of Business," 1941 Edition. A 16-page pamphlet with 60 illustrations describing the use of Lamson tubes to business.

*Stearns Magnetic Mfg. Co., Milwaukee.* A new 16-page reference catalog on the subject of magnetic pulleys and magnetic pulley separator units, containing descriptive matter, illustrations, specifications, applications, and a great deal of data on the subject.

The NEWS
DEFENSE EDITION
VOLUME X NUMBER X JULY 1941 CLEVELAND, OHIO

# NORTH AMERICAN FIRES GAS OR OIL IN SAME EQUIPMENT

## FOR DIFFERENT TEMPERATURES ON SAME FURNACE

The system will burn gas during low temperature operations and oil during high temperature operations on the same furnace. This change can be made by simply opening and closing valves.

## FOR DIFFERENT SEASONS

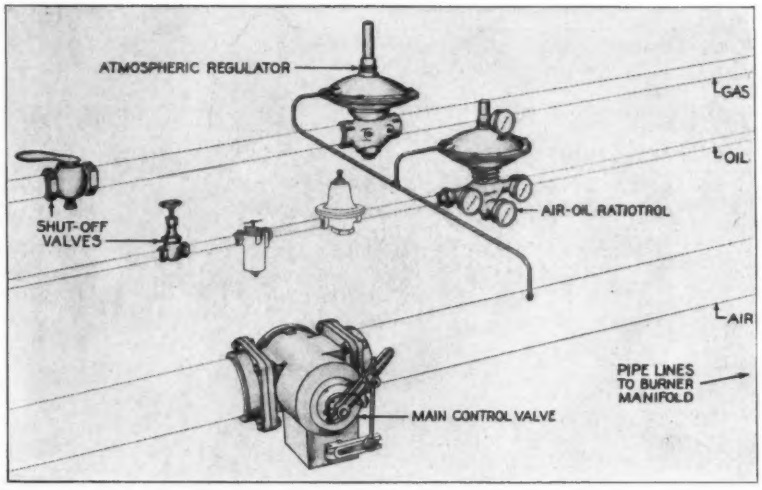
Many Gas Companies furnish gas at an especially attractive rate when used on an off-peak contract. The above system fills the requirements of standby equipment and simplicity of changeover. It is also being used by farsighted plant managers who fear that world conditions may change their fuel position.

## SIMILAR FLAME CHARACTERISTICS WITH EITHER FUEL POSSIBLE

By changing the insert of the standard Luminous Flame gas burners, a low pressure air atomizing oil burner can be provided. The same air valve controls the air and gas or oil supplied to the burners.

## *One Air Valve Controls Fire For Any Number Burners Either Gas or Oil*

## *Fuel-Air Ratio Automatically Controlled By Pressures*




In the North American pressure system of proportioning, the oil or gas is directly proportional to the air pressure on the downstream side of the main air control valve. Thus, air or fuel pressure variation, or number of burners in operation have no effect on fuel-air ratio, and thus maximum efficiencies are maintained.

Furthermore, the firing rate or fuel-air ratio of any burner can be changed in respect to the other burners without affecting their fuel-air ratio.

We cordially invite you to write for Engineering Data. The North American Manufacturing Co., 2910 E. 75th St., Cleveland, Ohio.—Adv.

# CURRENT PRICES OF GLASS-MAKING MATERIALS

**FURNISHED BY PRODUCERS, MANUFACTURERS AND DEALERS**

## Base Materials

| | | Carlots | Less Carlots |
|---|---|---|---|
| Barium carbonate ($BaCO_3$), Crude, (Witherite) | | | |
| 90%, 99% through 200 mesh | ton | 45.00 | 48.00–50.00 |
| Precipitated material | | 47.50 | 52.50 |
| Barium sulphate, in bags | ton | 19.00 | 24.00 |
| Barium sulphate, glassmaker's, carlots, bulk f. o. b. shipping point | ton | 15.00–16.00 | 18.00 |
| Borax ($Na_2B_4O_7 10H_2O$) | lb. | .... | .... |
| Granulated | In bags, lb. | .0215 | .027 –.0295 |
| Powdered | In bags, lb. | .024 | .0295–.032 |
| Boric acid ($H_3EO_3$) granulated | In bags, lb. | .048 | .054 –.0565 |
| Calcium phosphate ($Ca_3(PO_4)_2$) | lb. | .07 | .07½ |
| Cryolite ($Na_3Al\ F_6$) Natural Greenland (Kryolith) | lb. | .0865–.0875 | 0.925 |
| Synthetic (Artificial) | lb. | No supplies available. | |
| Feldspar—(published list prices) | | | |
| 20 mesh | ton | 11.00–13.25 | |
| 40 mesh | ton | 11.50–13.75 | |
| Granular | ton | 11.75–14.00 | |
| Semi-granular | ton | 11.00–13.25 | |
| L. C. L., (Min. 2 tons) $3.00 per ton additional plus charge for bags. | | | |
| Fluorspar ($CaF_2$) domestic, ground, 96–98% (max. $SiO_2$, 2½%) | | | |
| Bulk, carloads, f. o. b. mines | ton | 30.00 | .... |
| In bags | ton | 31.60 | 42.00–45.00 |
| Kryolith (see Cryolite) | | | |
| Lead Oxide ($Pb_3O_4$) (red lead) (N. Y.) | lb. | .0835 | .... |
| In 5 Ton lots | lb. | .... | .0875 |
| Less than 5 Tons | lb. | .... | .0925 |
| Lime— | | | |
| Hydrated ($Ca(OH)_2$–MgO) (in paper sacks) | ton | 8.50 | 8.50 |
| Burnt (CaO–MgO) ground, in bulk | ton | 7.00 | .... |
| Burnt, ground, in paper sacks | ton | 9.00 | 9.00 |
| Burnt, ground, in 180 lb. drums | Per drum | 1.60 | 1.70 |
| Kiln Dried ($CaCO_3$–$MgCO_3$) 10x30 mesh | ton | 1.75 | .... |
| Kiln Dried ($CaCO_3$–$MgCO_3$) 16x20 mesh | ton | 1.75 | .... |
| Nepheline Syenite, f. o. b. shipping point | ton | 12.00 | 15.00 |
| Potassium carbonate— | | | |
| Calcined ($K_2CO_3$) 96–98% | lb. | .065 | .0675 |
| Hydrated 80–85% | lb. | .055 | .0575 |
| Salt cake, glassmakers ($Na_2SO_4$) in bags | ton | 18.00–20.00 | 25.00 |
| in bulk | | 16.50 | |
| Soda ash ($Na_2CO_3$) dense, 58%— | | | |
| Bulk | Flat Per 100 lb. | .95 | .... |
| In barrels | Per 100 lb. | 1.35 | .... |
| In bags | Per 100 lb. | 1.10 | .... |
| Sodium nitrate ($NaNO_3$)— | | | |
| Refined (gran.) in bbls. | Per 100 lb. | .... | 3.00–3.40 |
| 95% and 97% | | | |
| Bulk | Per 100 lb. | 1.35 | .... |
| 200 lb. bags | | 1.44 | 1.465 |
| 100 lb. bags | | 1.475 | 1.50 |

## Special Materials

| | | Carlots | Less Carlots |
|---|---|---|---|
| Aluminum hydrate (Al $(OH)_3$) | lb. | .026–.029 | .04 |
| Aluminum oxide ($Al_2O_3$) | lb. | .07 | .09 |
| Antimony oxide ($Sb_2O_3$) | lb. | .15 | .15½–16 |
| Arsenic trioxide ($As_2O_3$) (dense white) 99% | | .04 | .05 |
| Barium nitrate ($Ba(NO_3)_2$) | lb. | .... | Open price |
| Pyrophyllite, (20% $Al_2O_3$) | ton | 9.00 | 12.00 |
| Sodium fluosilicate ($Na_2SiF_6$) | lb. | .12 | .15 |
| Tin Oxide ($SnO_3$) in bbls | lb. | .... | .55 |
| Titanium Oxide (ceramic grade) | | | |
| In bags | lb. | .14½ | .14¾–.15¼ |
| In barrels | lb. | .14¾ | .15 –.15½ |
| Zinc Oxide (ZnO) | | | |
| American process, bags | lb. | .6¼–.07 | .6¾–.07¼ |
| White Seal, 150 lb. bbls | lb. | .09 | .09¼ |
| Green Seal bags | lb. | .08¼ | .08½ |
| Domestic White Seal bags | lb. | .08¾ | .09 |
| Red Seal, bags | lb. | .07¾ | .08 |
| Zircon | | | |
| Refined Granular (Milled .01–.02c. higher) | | .06½ | .07–.08 |

## Coloring Materials

| | | Carlots | Less Carlots |
|---|---|---|---|
| Barium selenite ($BaSeO_3$) | lb. | .... | 1.40–1.60 |
| (Commercial, 25% Selenium) | lb. | .... | .85 |
| Cadmium sulphide (CdS) | lb. | .... | 1.10–1.15 |
| Cerium hydrate— | | | |
| 100 lb. drums and 600 lb. barrels | lb. | .... | .60 |
| Chrome Oxide Green, 400 lb. bbls | lb. | .... | .25–.28 |
| Chromite (99% through 200 mesh) | ton | 55.00 | 58.50 |
| Chromite ore (air floated) | ton | 55.00 | 58.50–73.00 |
| Cobalt oxide ($Co_2O_3$) | | | |
| In bbls. 350 lbs. or more, | lb. | .... | 1.84 |
| Less than 350 lbs., | lb. | .... | 1.94 |
| Copper oxide— | | | |
| Red ($Cu_2O$) | lb. | .... | .20–.22 |
| Black (CuO) | lb. | .... | .19–.22½ |
| Black prepared | lb. | .... | Open price |
| Iron Oxide— | | | |
| Red ($Fe_2O_3$) | lb. | .... | .05½–.09¾ |
| Black ($Fe_3O_4$) | lb. | .04½ | .09 |
| Iron Chromate | lb. | .... | .035–.05 |
| Lead Chromate( $PbCrO_4$) in bbls | lb. | .... | .145 |
| Lithium Carbonate | lb. | .... | 1.25 |
| Manganese, Black Oxide (Caucasian) | | | |
| In Paper bags | ton | 70.00 | 78.00 |
| In Burlap bags | ton | 71.75 | 79.75 |
| In Casks | ton | 74.00 | 82.00 |
| Neodymium oxalate, 50 lb. drums | lb. | .... | 4.00 |
| Nickel oxide ($Ni_2O_3$), black | lb. | .... | .35–.40 |
| Nickel monoxide (NiO), green | lb. | .... | .35–.37 |
| Potassium bichromate ($K_2Cr_2O_7$)— | | | |
| Crystals and Granular | lb. | .09½ | .09¾–.10 |
| Powdered | lb. | .... | .10¼–.10½ |
| Potassium Chromate ($K_2CrO_4$) 100 lb. kegs | lb. | .... | .27 |
| Powder blue | lb. | .... | .21–.25 |
| Rare earth hydrate— | | | |
| 100 lb. drums | lb. | .... | .35 |
| 325 lb. barrels | lb. | .... | .30 |
| Selenium (Se) In 100 lb. lots | lb. | .... | 1.75 |
| In lesser quantities | lb. | .... | 1.85 |
| Sodium bichromate ($Na_2Cr_2O_7$) | lb. | .07¼ | .07½–.07¾ |
| Sodium chromate ($Na_2CrO_7$) Anhydrous | lb. | .08⅝ | .08⅞–.09⅛ |
| Sodium selenite ($Na_2SeO_3$) | lb. | .... | 1.50–1.65 |
| Sodium uranate ($Na_2UO_4$) Orange | lb. | .... | 1.65 |
| Yellow | lb. | .... | 1.65 |
| Sulphur (S)— | | | |
| Flowers, in bbls | Per 100 lb. | 3.35 | 3.70–4.10 |
| Flowers, in bags | Per 100 lb. | 3.00 | 3.35–3.75 |
| Flour, heavy, in 250 lb. bags | Per 100 lb. | 2.90 | 3.25–3.65 |
| Uranium oxide ($UO_2$) (black, 96% $U_2O_6$) 100 lb. lots. Black | lb. | .... | 2.55 |
| Yellow orange | lb. | .... | 1.65 |

## Polishing Materials

| | | Carlots | Less Varlots |
|---|---|---|---|
| Emery, Turkish | lb. | .072 | .08 |
| Pumice Stone, | | | |
| American Ground Italian FFF, FF, F | lb. | .... | open price |
| 0, 0½, ½, 1 | lb. | .... | open price |
| Putty Powder | lb. | Open price. | |
| Rotten Stone, (Domestic) | lb. | .02¼ | .03½ |
| Rouge, Red | lb. | .... | .16 |
| Black | lb. | .... | .18 |

### WALTER R. LEACH

After a short illness, Walter R. Leach, Secretary and General Manager of the Carr-Lowrey Glass Company, died August 3, 1941, at his home, Chela Farms, in Phoenix, Maryland.

Mr. Leach was born in Baltimore, December 8, 1880. At the age of 15, he entered the employ of the Carr-Lowrey Glass Company as office boy. From the start, his capabilities became apparent and after a short apprenticeship, he was sent out on the road as salesman. In 1914, he became General Manager and three years later was elected Secretary of the Company.

Mr. Leach was known throughout the entire glass container industry of this country, in whose national affairs he figured prominently. At his death he was serving as a member of the Standardization and Tariff Committees of the Glass Container Association. In 1937 he purchased his Phoenix estate, which he developed as a model dairy farm.

Besides his widow, Elsie Wagner Leach, he is survived by two sons, Walter R. Leach, Jr., and Dr. C. Edward Leach, and also by a brother E. Edwin Leach.

### THIN GLASS FOR MICROSCOPE COVER SLIPS

The year 1940 marked the centenary of the manufacture in Great Britain of specially thin glass for microscope coverslips. Prior to this date it was customary for microscopists to use thin talc or mica for covering specimens to be examined under the microscope. This manufacture was started by Messrs. Chance Brothers and Co., Limited, at Smethwick, in 1840 as nearly as is known, and has been carried on continuously by the same firm up to the present day. The War has called for a considerable increase in the supplies of such glass, both in Great Britain and abroad. There was no essential change in this type of glass until about 1928 when a research was carried out on the development of microscope cover-slips. It was found that the old type of glass, which was essentially like window glass, would not withstand tropical conditions without becoming clouded. Therefore new methods of manufacturing a glass which would withstand sterilizing and exposure to tropical atmosphere without any deterioration were introduced. The thickness of cover-slip glass is still classified under the headings:

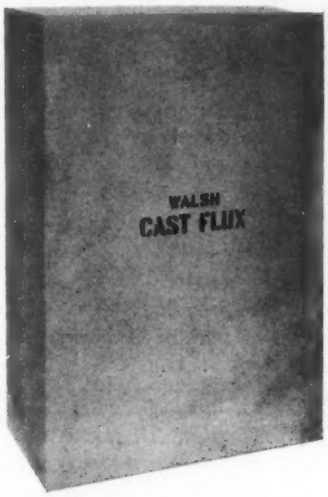
| | |
|---|---|
| Extra thin | (0.075—0.100 mm) |
| No. 1 | (0.100—0.167 mm) |
| No. 2 | (0.167—0.215 mm) |
| No. 3 | (0.215—0.300 mm) |

These correspond closely with the figures quoted in a catalogue issued by the firm in March, 1859, which says No. 1 is 1/250 in. in thickness, No. 2 1/160 in. and No. 3 about 1/100 in.

### CERAMIC ARTS SALON OPENS IN OCTOBER

The New York Society of Ceramic Arts will hold its forty-first annual exhibition at the Barbizon Plaza Art Galleries, New York City, from October 27 through November 20. This date is considerably earlier than in previous years and was chosen to anticipate the Christmas buying season. All exhibits will be on sale and deliveries made at the close of the exhibit. Entry blanks may be obtained by writing to Mrs. William P. Willetts, Secretary, Roslyn Heights, New York.


# WALSH CAST-FLUX




**The Vacuum-cast flux block of superior quality.**

**Walsh Cast-Flux blocks are machine-trued to exact size and shape after burning.**

## THEY LAST LONGER

The excellent results obtained in numerous tanks melting various types of glass has definitely established the efficiency and economy of Walsh Cast-Flux blocks.

Walsh Cast-Flux has a dense, uniform structure; it is burned at higher temperatures, is thoroughly bonded and possesses a low coefficient of expansion.

Walsh Cast-Flux blocks meet the most rigid requirements for tanks operating at higher temperatures . . . they insure greater tonnage, higher quality glass, freedom from defects, longer life and maximum economy.

## WALSH REFRACTORIES CORPORATION

Manufacturers of Refractories for the glass industry for over 50 years

**4428 North First Street**

**St. Louis Missouri**

# COLORS that *Sell!*

● Colors from HOMMEL give extra attractiveness to your products—lend an unusual richness that SELLS. Hundreds of satisfied customers use eye appealing HOMMEL shades for finest results.

Transparent and Opaque — Enamels and Fluxes — Liquid Lustre Colors — Acid and Alkali Resistant — Ices — Squeegee Colors — Burnish Gold and Silver.

Complete line of Glassmakers Chemicals including Barium Carbonate — Borax—Cadmium Sulphide—Feldspar — Fluorspar — Manganese Dioxide — Potassum Bichromate — Soda Ash — Sodium Nitrate — Uranium Oxide.

**THE O. HOMMEL COMPANY**
209 FOURTH AVE., PITTSBURGH, PENNA.
Factory: CARNEGIE, PENNA., New York Office: 200 WEST 34th ST.

# *Aplite*

This new material for incorporating ALUMINA in glass at lower cost is providing excellent results.

**DOMINION MINERALS, INC.**
SHOREHAM BUILDING
WASHINGTON, D. C.

Pioneer Producer of APLITE
**AlNaK**

# 1/5 the Width of a Human Hair

Instruments which play so important a part in national defense call for precision manufacturing methods which Bausch & Lomb has developed over years of producing fine optical instruments. Here, in air-conditioned rooms, deft operators accurately space and engrave lines only 1/5th as wide as a human hair on binocular "mil" scales.

**BAUSCH & LOMB**
OPTICAL CO. • ROCHESTER, NEW YORK
ESTABLISHED 1853

AN AMERICAN SCIENTIFIC INSTITUTION PRODUCING OPTICAL GLASS AND INSTRUMENTS FOR NATIONAL DEFENSE, EDUCATION, RESEARCH, INDUSTRY AND EYESIGHT CORRECTION

# LEADING MANUFACTURERS
## *Rely on our Felts*

American Polishing Felts give superior service and have longer, satisfactory life. Polishing costs less and goes along without hitches when American Quality Felt is used, because it has uniform density and increased absorption properties. Greater strength against strains and stresses of mounting felt on the polishing head is another reason. Then, too, our Felt is put through a conditioning process which makes it ideal for beginning of the line and effects long life so that it performs satisfactorily at the important end of the line polishing. You are cordially invited to discuss any problem regarding polishing or the use of Felt with our Technical and Research Staffs.

**American Felt Company**
TRADE MARK

*General Offices:* GLENVILLE, CONN.
Plants at Glenville, Conn., Newburgh, N. Y., Franklin, Mass., City Mills, Mass., Detroit, Mich.
***Manufacturers of*** **Polishing Felt, Scratch Wheel Felt, Polishing Wheels, Glass Setting Strips, Blocking Felt, Channel Felt, Table Cover Felt.**

DESIGNS
MODELS
MOULDS
MOULD CASTINGS
Quality and Quick Service
....450 EMPLOYEES
OVERMYER
MOULD COMPANY
WINCHESTER, IND.

# WE TOO, ARE . . .

## *Serving* UNCLE SAM

WHEN miracles must be performed, it is natural that Uncle Sam should look to the Magic of the Chemical Industry.

The Industry has responded right nobly—and in this response, we are proud to bear our part.

In answering the call of the Country, we are of necessity handicapped in our efforts to maintain the prompt deliveries so long associated with ISCO Service and ISCO Chemicals.

No stone is being left unturned to serve you as well as it is possible under conditions which include dearth or absence of many vital raw materials.

Please continue to call on us for your needs, with confidence that ISCO will deliver the goods you want—if it is humanly possible.

*Announcing . . .*

**our new branch in CINCINNATI**

To take care of our increasing business in Southern Ohio, Indiana and Kentucky and to still better serve our customers in this territory, we have opened a Cincinnati Branch ● The address is Carew Tower and this new office, a sub-division of our Cleveland Branch, is in charge of Mr. Robert D. Kane, formerly of our Cleveland Branch.

**INNIS, SPEIDEN & CO.**
Established 1816
117-119 LIBERTY STREET, NEW YORK, N. Y.
Chicago Cleveland Cincinnati Boston Philadelphia Gloversville, N. Y.
Factories: Niagara Falls, N. Y. Jersey City, N. J.

# THE OTTAWA SILICA COMPANY

OTTAWA. ILLINOIS

ETERNAL AS THE SANDS OF TIME

The PRINCE of GLASS SANDS — The Famous OTTAWA WHITE SAND

THREE PLANTS TO SERVE YOU

OPERATING YEAR AROUND

CRYSTAL SILICA 99⅝% PURE

THE SHARP-SCHURTZ COMPANY

CHEMISTS AND CONSULTING ENGINEERS

FOR THE GLASS INDUSTRY

LANCASTER, OHIO U. S. A.

**MIN-OX**

The Binney Castings Company

Originators of Alloys for Glass Moulds

2555 Dorr Street Toledo, Ohio

**GLASS INSPECTION**
**with the *Polaroid***

*Spectacle type polariscope*

THE polarizing spectacle, mounted in unit with sensitive tint plate of 565 millimicrons, presents an absolutely uniform field of large aperture, strains showing up in sharply defined and correct colors.

Standard size apertures are 6" diameter and 12" diameter; but any special size to meet your requirement can be made. They are all light in weight and a leather case can be furnished where required. The 6" unit is suggested for either plant inspection uses or—as a portable unit for the trouble shooter or the salesman where a large aperture, compact unit of light weight is desirable.

**THE POLARIZING INSTRUMENT CO.**
**630 Fifth Ave.** (Rockefeller Center) **New York City**

There's ever so much to see and do

***in Baltimore!***

Historic shrines, Maryland cooking, horse racing, yachting on the Chesapeake . . . and a hundred and one other fascinating attractions! The city's newest and largest hotel is located a short distance from everything you want to see . . . in the middle of the business, shopping and amusement districts.

700 ROOMS FROM $3

LORD BALTIMORE HOTEL

BALTIMORE, MARYLAND

# FLUXTITE by LACLEDE-CHRISTY

. . . the tank block of accurate structure balance made by ceramic experts from a precision blend of fire clays, including the famous Missouri Washed Pot Clays.

Fluxtite and its companion products, Laclede's Super Refractory Mix 89 and Laclede's Refractory Upperstructure, have been and are now meeting the strict requirements of the producers of soda-lime, boro-silicate and all other glasses.

Laclede-Christy, "The Glass Industry Specialists," have everything in refractories for the glasshouse. Consult with . . .

LACLEDE-CHRISTY

*The World's Largest Producers of Glass House Refractories*

ST. LOUIS . . TOLEDO

## GLASS SPECIALTIES

Transparent Colored Blown Sheet Glass
Solid Pot Opal Blown Sheet Glass
Flashed Opal Blown Sheet Glass
Colonial Antique Colored Glass
Heat-Ray Resisting (Cool Glass)
"TWIN-RAY" — the scientific illuminating glass.

HOUZEX

L. J. HOUZE
CONVEX GLASS CO.
Point Marion, Pennsylvania
New York Office: 110 West 40th St.
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"IF IT'S MADE OF GLASS, ASK US FIRST"

## GLASS SLICING MACHINES

• We manufacture a variety of wet glass slicing machines for solid glass bars, glass tubing, etc. We can also supply a full line of special glass working machinery for the production of television tubes, fluorescent tubes, incandescent lamps, glass ampules and vials. Glass working lathes and laboratory equipment of all kinds. Cross Fires and Torches. Ask for our catalogue.

•

EISLER ENGINEERING CO.
CHAS. EISLER, Pres.
742 SOUTH 13TH STREET
(Near Avon Avenue)
NEWARK, N. J.

HUNDREDS OF GLASSMEN ARE NOW USING THE

## Handbook of the Glass Industry

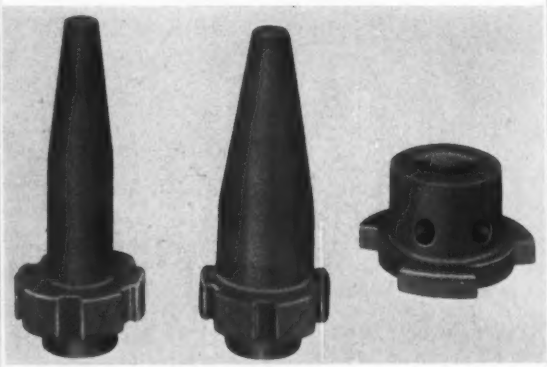
Compiled and edited exclusively for glassmen the *Handbook of the Glass Industry* contains pertinent data which is being used by glass plant executives throughout the industry. It is comprehensive in its scope of subjects and is proving an invaluable tool for the general factory manager, superintendent, combustion engineer, chemist, department foreman and by every glassman regardless of his title or job.

It is a book you too will use every day—it is factual and comprehensive—it will obviate hunting in a half a dozen places for the answer to your problem . . . in time saved it will pay for itself many times over the first week you have it.

*Price $5.00* • *Send your order to*

THE GLASS INDUSTRY
11 West 42nd Street New York, N. Y.

## For Plungers



### Gunite Standard grade A

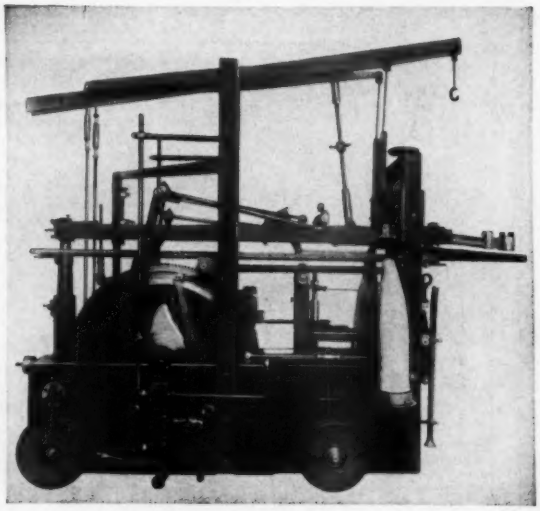
Gunite Foundries Corporation having developed various metals to meet specific glasshouse requirements, recommends for plungers, its Standard grade "A" Castings. Long life, excellent thermo-conductivity and unusual freedom from foundry defects are inherent qualities of Gunite Plungers. May we send you descriptive information on all Gunite glasshouse castings?

GUNITE
FOUNDRIES CORPORATION
ROCKFORD ILLINOIS

# ROIRANT

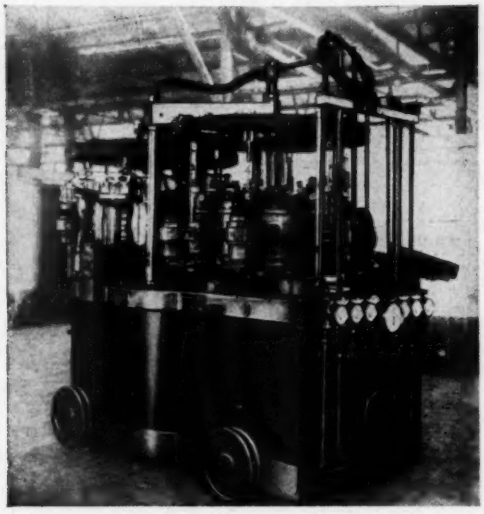
## SINGLE AND MULTI-MOULD MACHINES

*Universally known for the production of small and large bottles*



Type "F" single - mould suction machine for the production of small ware

Type "A6" twin table six-arm suction machine for the production of bottles



Also type "B" single-mould suction machine for bottles and type "BB2" suction machine for carboys up to a capacity of about 14 gallons

*Any particulars from:*

**SOCIÉTÉ CONTINENTALE**
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